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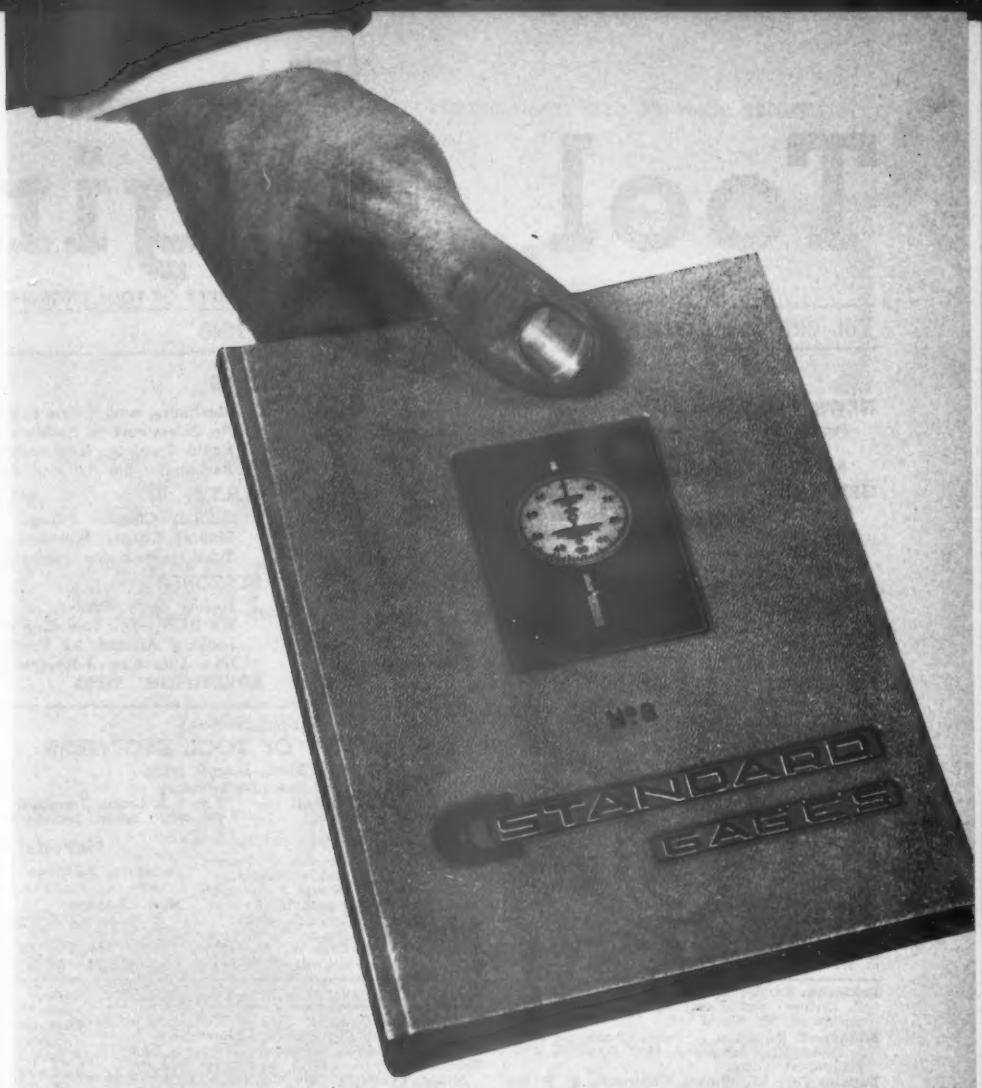

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Vol. VIII JANUARY, 1940 No. 9

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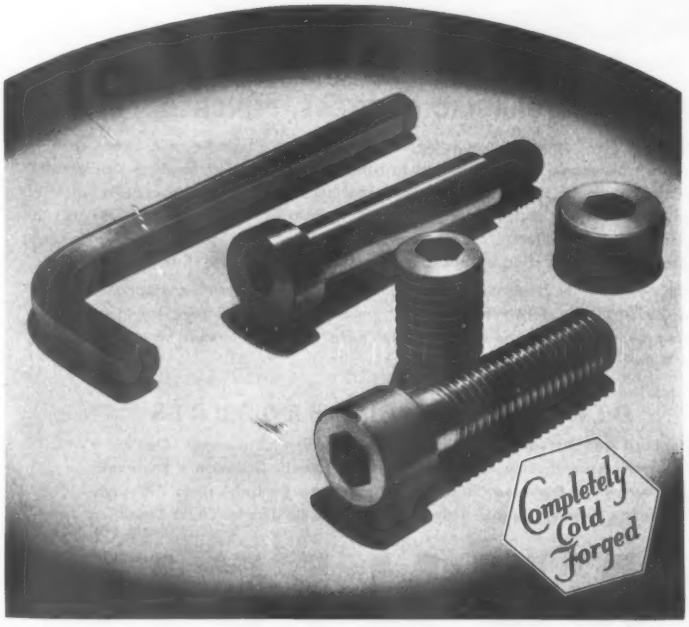

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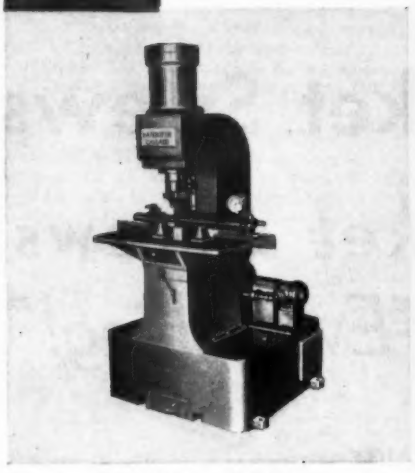

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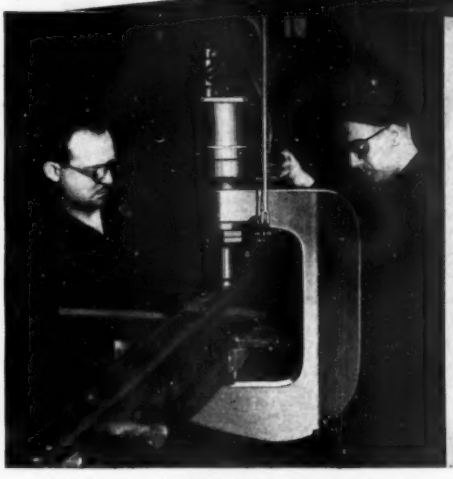

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NOT for Today
BUT FOR TOMORROW!

AN EDITORIAL
By
A. E. RYLANDER

AS foreign nations build up resources for war, and as our own government quietly prepares for a possible M day, American industry faces a paradoxical situation. Foreign demand on American manufactured goods results in an inordinate domestic demand for tools, machinery and mechanical equipment for their processing. Demand is obsoleting the comparatively modern, the while rising labor costs necessitate the ultimate in cost-saving equipment. Coincidentally, the foreign powers place heavy orders with American machine tool builders, orders that, because of emergency, must be promptly filled. The machine tool builders, then, are faced with the choice of meeting foreign demand at the expense of domestic business, and of risking a future domestic market if the immediate demands of foreign buyers are met. Truly a dilemma that would tax the wisdom of a Solomon!

As the situation becomes acute, and domestic deliveries in certain lines are quoted in '41 or later, there is an undercurrent of dissatisfaction, an imputation that the machine tool builders are selling out the future for the profits of the present. Well, there is nothing new in that, since a somewhat similar condition prevailed during the previous war. But then, America produced munitions even when overtly neutral and American industry was "educated" at the expense of foreign belligerents. Knowing what happened to domestic industry when the armistice was declared, we should profit by a previous lesson.

As we see it, the issue is rather clear cut, and entirely in harmony with editorial opinion previously expressed in "The Tool Engineer." Conceding that the filling of foreign orders is entirely legitimate—it is good business—it is equally logical that, when the inevitable slump comes at the end of the war, future business for American machine tool builders must come from domestic buyers. Therefore, the domestic market should be favored over all others, even if this means an unprecedented plant expansion at this time. If this phase is not considered on its merits, American industry may have to work with obsolete equipment whereas foreign competitors will have an edge with the latest developments.

There is, of course, the consideration that plant expansion may leave industry "land poor," i.e., with holdings in real estate beyond immediate peacetime needs. But that is a lesser risk, as we see it, than dropping suddenly from the crest of a boom wave to the nadir of depression. We've gone through that, and once is enough. The risk can be largely mitigated by careful planning for the future. Let us, now, devote time and energy toward building up domestic markets, by which is meant the entire western hemisphere. It can be done, must be done for the sake of our economic salvation. There is nothing selfish in this proposition; rather, it is practically unselfish.

We know, by now, the causes of depression—especially the cause of post-war depression. That cause is largely putting all ones eggs into one basket, then having the bottom drop out of the container. In extreme circumstances, only a minority of American citizens would be called to the colors in the event that we be drawn into war, and only a minority would actively serve those at the front. Everybody, including fighters and those who supply, would be the better off if the majority lives naturally, pursues wonted occupations and buys as per habit. Then, when peace comes, the letdown on war materials and the return of the soldiers should cause but little confusion. There will be a going business for our fighters to turn their hands to, a host of employed to buy the products of the machine. More, with modern equipment, American industry will have an enviable lead on foreign competitors.

War, we admit, is a grim business, in which one must fight to live. But there is always the aftermath, which so far does not seem to have been considered, and which, for the masses of the people, may be worse than the exigencies of war. As, for instance, malnutrition and despair, moral and physical degeneracy, a younger generation growing up without gainful employment and prey to the preachers of defeatism. We have the brains and intelligence to build for the future, but we must break ground now, before the deluge. Tomorrow may be too late.

✓ Bob—
Re: Greater production for 1940—
These are the machines I heard such good reports
about on my last trip—better investigate— H.J.M.

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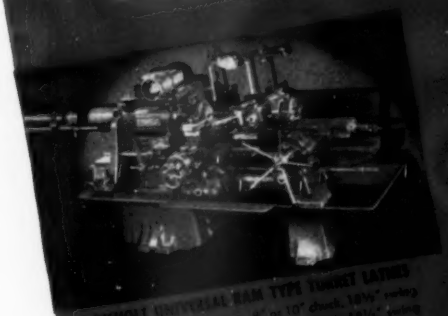

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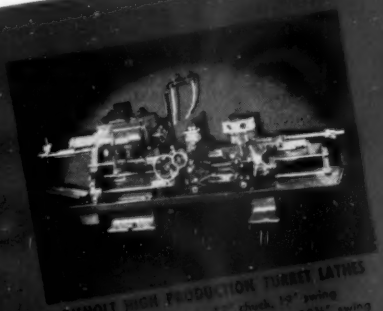

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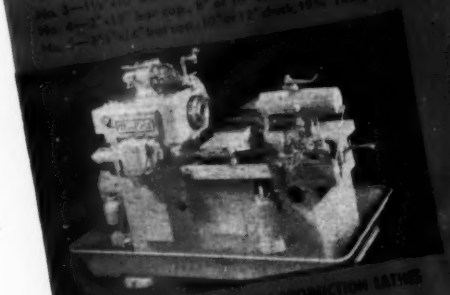

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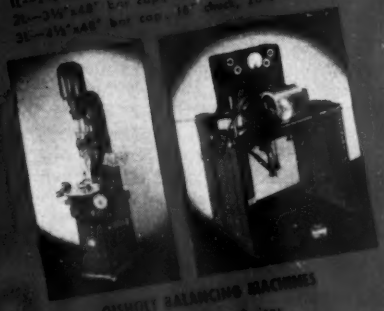

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New York-- Scene of 1940 Annual Meeting

"EDUCATION"—THEME OF TECHNICAL SESSIONS

PLANS for the American Society of Tool Engineers' Annual National Meeting are rapidly nearing completion. What is expected to be one of the largest meetings yet held by the young but virile Society will provide the first opportunity of the National Membership to trek Eastward—to the largest city in the world, and to a convention packed full of meaty technical sessions and entertainment features you nor your family will not want to miss. Yes, we said family, for definite arrangements are being made to include lady A.S.T.Eers—particularly the wives of A.S.T.Eers from coast to coast and from Canada to the Gulf.

New York City is a marvelous place to go—to see things—to do things—to go places. No city of the world provides more opportunity for a liberal education in art and music, in education and recreation, in "much for little" . . . no city of the world is more richly open-handed in welcome. It provides Tool Engineers and their ladies a never-ending array of new sights and new experiences with ample opportunities for pleasure and a change of scene. Plan now to attend.

The New Yorker Hotel, having the largest number of rooms of any hotel in New York City, will be headquarters for the meeting. In this tremendous hostelry are all facilities for your every need. It is a self-contained unit with its own hospital, its own laundry, bakery, cold storage plant—even its own power house providing its own light and heat —a city in itself—an excellent place for meetings and the A.S.T.E. Headquarters.

Program

The dates for the meeting have been definitely set for March 7th, 8th and 9th, 1940. The meeting will include the A.S.T.E. Directors' Meeting, all national committee meetings, numerous technical sessions and symposiums and the third and final report of the A.S.T.E. Fact-Finding Committee.

"Education" is the theme of the 1940 National Meeting. In New York is provided a splendid background for education in seeing the greatest and largest city in the world, in the technical sessions, in hearing the nations greatest authorities and in discussions with other Tool Engineers of mutual problems and processes to aid you gain a better grip and a better understanding of your job and your profession. This year there will be no A.S.T.E. Machine and Tool Progress Exhibition in connection with the Annual Meeting as in the past two years, and thus is provided an even greater opportunity to attend each and every worthwhile symposium and session which has been so carefully planned for your instruction and interest.

Technical Subjects
to be Covered

Economic Tooling
Production of Precision Small Gears
Tooling for Plastics
Screw Machine Tooling
Punches and Dies for Large and Small Products
Tool Engineering Education
Cutting Tools and Materials

Third Report—"Factors Which Contribute to Unemployment and a Lower Standard of Living"

Subjects Announced

Among the subjects to be discussed are "Economics of Tooling," "Production of Precision Small Gears," "Tooling for Plastics," "Screw Machine Tooling," "Punches and Dies for Large and Small Products," "Tool Engineering Education" and "Cutting Tools and Materials." The third and final report of the Fact-Finding Committee will also be given. It is entitled "Factors Which Contribute to Unemployment and a Lower Standard of Living."

An outstanding aim of this year's meeting will be to develop a formula to ascertain economic tool cost based on volume of production. It is expected that enough information will be obtained through the various papers to develop such a formula or to establish a method for determining proper tool costs when variables such as value of unit to be produced and production schedule are known.

Another objective of the meeting this year will be to develop a plan whereby the American Society of Tool Engineers may sponsor courses in Tool Engineer-

(Continued on page 40)

PRODUCTION PRODUCTION

THESE ARE FACTS

"The *'Greenfield'* engineer who suggested the use of 'Maxi' taps on this job gave us advice that has turned out to be the best possible insurance against production loss in our plant," writes this Pennsylvania Manufacturer.

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ELEMENTS IN THE DESIGN OF

PORTABLE HYDRAULIC RIVETER FRAMES

By A. E. RYLANDER

SUPERVISOR, SPECIAL EQUIPMENT DESIGN, MIDLAND STEEL PRODUCTS COMPANY, DETROIT.

FUNDAMENTALLY, frames used in both hydraulic and pneumatic squeeze riveting are big brothers of the small, screw type rivet extractor and squeezer used by bicycle repairmen in replacing links on sprocket chains. They are just stepped up for high power and speed, the latter implying a potential output of 10 rivets squeezed in 18 seconds or less. The rate depends on accessibility of rivets and handling of tool, partly on its design. While special designs are necessary at times, as "scissor" and "alligator" types, these will not be discussed here, neither will there be any attempt to lay down hard and fast rules. Rather, since design varies with application, we will be concerned here with the plain "C" frame, commonly used.

First Consideration

In designing hydraulic riveter frames, the first consideration is clearance. There is the hole—or pocket—where the rivet is to be squeezed. Clearance established, one builds strength into the resultant cross section, determined by the size of opening the product engineers have left for tooling. This may entail odd shapes; one takes advantage of every corner in which to pack an extra 1/16th inch of metal if the tool is to stand up in use. And use, in hydraulic riveting, implies recurrently heavy loads with severe tangential and side strains as well as severe shock and, often, torsional strains. Loads range from 12 to 17 tons or more for 5/16 and 3/8 rivets, respectively, and heavy production may entail 800 blows or more per hour. Naturally, there is involved nicety of design, careful distribution of metal, a fine choice of material and careful processing. These elements will be considered in turn.

If, having worked out a minimum cross section, it is found to be inadequate, then obviously there is no sense in building a tool that is destined to failure. One resorts to other methods. (In all fairness to the engineer, however, failure may not necessarily be due to faulty design or calculation, as will be shown later). Alternative methods are: Pneumatic squeeze riveting, (similar in principle and very efficient if somewhat less flexible) hot riveting, cold heading by press and cold expanded rivets. Each method has its exponents, although, in the writer's opinion, cold squeezing is the superior method, accessibility permitting use. It is silent and fast, the rivets used are cheap and obtainable in any commercial shape desired. Another factor in cold squeezing is the greater grip of the rivets; they stay put.

Consider that a riveting press, for cold heading, and powerful enough to drive two or three rivets simultaneously but often as not used to drive but one, may weigh a ton or more. But the portable riveter, with work cylinder, hose, wiring and switch, will average a hundred pounds—practically nothing, as far as the operator is concerned if properly balanced. Without recommending any one system over the other, the choice rests between bringing the work to the tool and bringing the tool to the work. Where the work is cumbersome or heavy, the portable tool has decided advantages over the stationary.

Referring to Fig. 1, we have a typical C frame; work cylinder, clamp nut, dies and suspension yoke in phantom outline. For future reference we will call "A" the hub length, "L" the gap, "D" the throat and "G" the center of gravity or neutral line. The profile is marked off as neck, body and beam. We will not go into dimensions, which would vary with application and work cylinder used; the illustrations, however, may be considered of good proportion. For various cross sections of beams, refer to Fig. 7. The shapes shown are typical, illustrative rather than applicable to any specific job.

Cross section of beam determined, the next consideration is gap and throat depth, also determined by work to be processed. The gap embraces, in order, the length of work cylinder guide below the hub, (where clamp nut is applied) the length of dies required and stroke. If a commercial work cylinder has 3" stroke, the stroke used should be less than 3" to allow for "cover run." Preferably, stroke used should be as short as possible while leaving sufficient clearance for dies to pass over work. The throat depth is, naturally, determined by interferences on part, but, the less the depth the smaller the cross section of body and, consequently, the lighter the tool. Having determined inside clearances, we arrive at inside profile, keeping angle of neck 20° or more, with enough clearance for work cylinder not seat and the largest radii that the job will permit. Outside profile is determined by proportioning metal to withstand load.

Ideal Profile of Yoke

Developed, the ideal profile would be analogous to a cantilever leaf spring, uniformly tapered from seat to end. (See Fig. 4). But ideals are the exception rather than the rule in tool design; we shoot at the ideal and arrive at the practical. The tapering development results in "spring," so that load is distributed over a considerable length of frame, becoming absorbed toward the shoulder, i. e., juncture of body and neck. Now, while spring absorbs shock and reduces hazard of breakage, too much will throw the dies out of line as the load comes on; the frame must go "solid" at the approximate tonnage required to squeeze a given size of rivet. Hence, a compromise to insure such solidity.

Where interferences in product necessitate a thin "flat" beam, as in Fig. 2, strength is acquired by increasing the width in disproportionate ratio

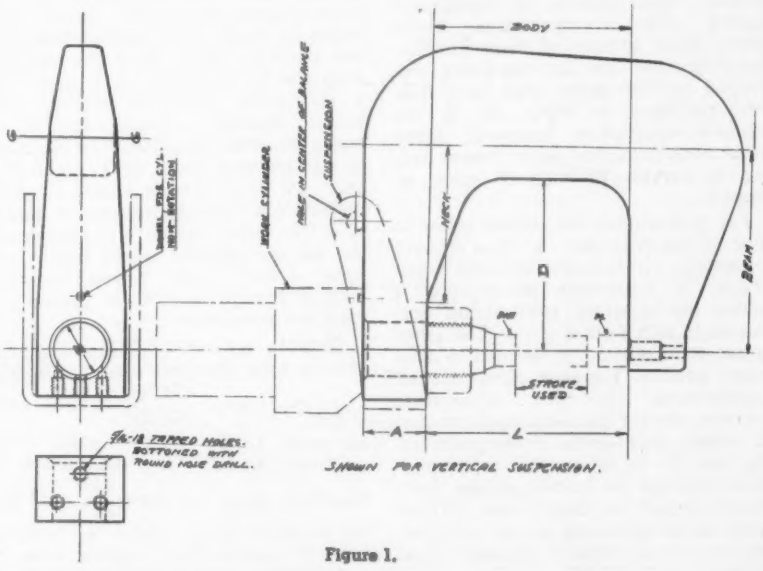

Figure 1.

to thickness. That is, the cross section would be greater than for a beam of normal depth. Offset frames, as in Fig. 3, are not recommended due to twist under load. Where possible, such frames should be designed so that point "P" is tangent with center line or slightly ahead. Sometimes a job necessitates a goose-neck frame, as in Fig. 6, but these are heavy and awkward, must be "snaked" in unless extra long stroke is used. But a long stroke entails a long frame, with added weight, so, using standard stroke, we locate suspension eye at center of gravity with all attachments in place. Then, the frame "rolls" into position.

A simple way to determine center of gravity of assembled unit is to draw frame, with work cylinder in place, on a sheet of cardboard. Then, cut out the picture and find center of balance with a common pin or thumb tack. In actual balance of frame, it should be assembled with work cylinder, then, a C clamp with sharp centers on screw and anvil can be used to accurately determine balance by trial. There are usually too many variables for accurate calculation, and the method suggested is quick and entirely practical.

Referring back to Fig. 1, the writer has found that the suspension shown is preferable to a band clamped around the body or neck of frame. The latter is hard to put on and hard to take off, especially when high production demands quick replacement in case of tool failure. Besides, the band reduces clearances. In the method shown, three 5/16" holes are tapped in a milled face on hub, standardized as to center distance. That way, the entire frame assembly can be detached and replaced in a jiffy. Sometimes it is desirable to rock frame in all directions, when a modified universal joint or gymbal mounting is used. As a rule, manufacturers of riveter frames do not recommend tapped holes, because of possible hardening cracks. They are entirely right; makers of equipment cannot afford compromises which might affect quality of their product. Such liberties are for engineers employed by the users, who have specific problems to work out. In the writer's experience, however, there have been no instances of frames failing in service because of holes so tapped.

Fig. 6 illustrates the several types of dies in common use; "a" is a straight button die, "b" a button die with small shank, "c" a shoulder die and "e" a button die in which anvil radius corresponds with radius of die. The latter is not good design, is resorted to only when product imposes close radial interferences. In this connection, product should be designed so that 1/4" rivets center in 9/16" radii minimum, 5/16" and 3/8" in 5/8" and 3/4" radii, minimum. Radius of frame, at die seat, (anvil) should be slightly less. Where rivets to be squeezed are in a pocket, so that work cylinder plunger must pass interference, then clearance in product should be radius of plunger plus 1/16" minimum. This entails some cooperation between Product and Tool Engineers, with advantage to both. An important and related consideration since, product designed or modified to suit portable riveting, ample clearances reduce inventory of riveter frames as well as of hydraulic units.

Still referring to Fig. 6, "e" and "f" are top dies, shown in section of plunger. In "e" the die is secured by a set screw, in "f" with a rubber band wound into an annular groove. The latter method is cheap and efficient. While small button dies may be a light drive fit, the larger are usually slip fit on shanks. They may become stuck, however. A small drilled hole in plunger, or one tapped for a Zerk fitting, permits forcing out dies with a high pressure lubricator. Note that dies "e" and "f" have stem diameter corresponding to "c", the preferable design since top and bottom dies can be interchanged. A large stem diameter is preferable to a smaller; there is less likelihood of ovalizing holes, an eventual occurence where long dies are used. Short dies are preferable to long ones; for best results, should not be over 1½" body length for "c", "e" and "f" types. In long dies, side strains multiply into enormous leverages, resulting in oval holes or breakage. The dies shown are for round head rivets, and while not dimensioned, the proportions may be considered correct.

Calculating Cross Sections

In calculating body cross sections, one assumes a lever the length of the beam, i. e., from die center to neutral axis or center of gravity of section. It is assumed that all metal ahead of neutral axis is under tension, the rest under compression. From examination of various fractures—some so sharply defined that cleavage could be accurately determined—the writer has found, by scale measurement, that neutral point is about 1/3 of the section, from the front. Assuming a frame for a 5/16" rivet, requiring roughly 12½ tons to squeeze, a throat depth of 5" and a tentative body depth of 4", then, on an assumed basis of 1/3 to neutral axis, the beam length would be 6.33 inches. We will use a factor of safety of 3:1 for steel forging and, disregarding for the moment yield point, will select a steel with tensile strength 100,000 lbs. p. s. i. Then, converting tons into pounds, we have:

25,000 x 6.33=474,750 lbs. stress at neutral axis. Dividing this by tensile strength of steel: $\frac{474,750}{100,000} = 4.74"$ area of metal around neutral axis. Now, doubling the 1.33" from neutral axis to front of throat, we have $\frac{4.74}{2.66} = 1.86"$ for width of body, which we will arbitrarily resolve to 2" width even (if frame may squeeze 3/8" rivets as well). 2" width x 4" depth equals 8" total cross section area of body, which can now be tapered as shown in sections, Figs. 2 and 3. This slightly modifies the figures; say a reduction of area to 7½". The proportions of width to depth are approximately correct; in practice, a frame of 5½" throat depth is usually made 2 x 4", the taper reducing area to about 7¾". The method of calculation is reduced to simplest terms, for clarity, and is for ordinary applications. Special consideration must be given to the unusual job. In the writer's experience, frames of half the section mentioned have stood up remarkably well, although extremes are not recommended.

A few comments on materials and processing may be in order. While there is a trend to cast frames, these are necessarily heavier and more cumbersome, require considerable experimentation and research and, until alloys are developed to a point where they can be cast anywhere, are not recommended at this time. For general purpose work, and especially when remote from service, the forged, machined all over frame is preferable. S. A. E. 3250 steel is considered good, with S. A. E. 6150 electric furnace processed recommended for small sections subject to heavy load. Forgings must be free from flaws and cold shuts, should be normalized, then, after rough machining, reheated to relieve strains, finish machine and polish, leaving stock in die and work cylinder bores for final sizing after hardening. Holes should be in line plus or minus .003". Frames should, where possible, be given a final buffing before being put into service.

Causes of failure, in service, may be due to flaws in material, hardening checks and even to scratches that start cracks when in use. Another cause—and a most annoying one—is twist due to driving rivets "cocked", i. e., at an angle to axis. This sets up sharp whip, the frame breaking from shock rather than load. Fatigue is a major consideration, entails selection of material that is fatigue resistant. It is a good idea to give frames a rest at stated intervals, with an annealing to normalize, the latter, however, at the heat used in drawing from original hardening.

Properly designed, processed and used, the portable riveters should give long and efficient service. They do produce. Yet, the writer would add a note of caution: Hydraulic riveting is a comparatively new art in metal processing, although the method has long since transcended the experimental stage. Commercial units are entirely reliable. However, design and manufacture involve experience and, for reliability and low tool costs, considerable equipment. Hence, the same rule applies here as in most cases where commercial tools are available. Refer your hydraulic riveting problems to specialists.

PORTABLE HYDRAULIC RIVETER FRAMES

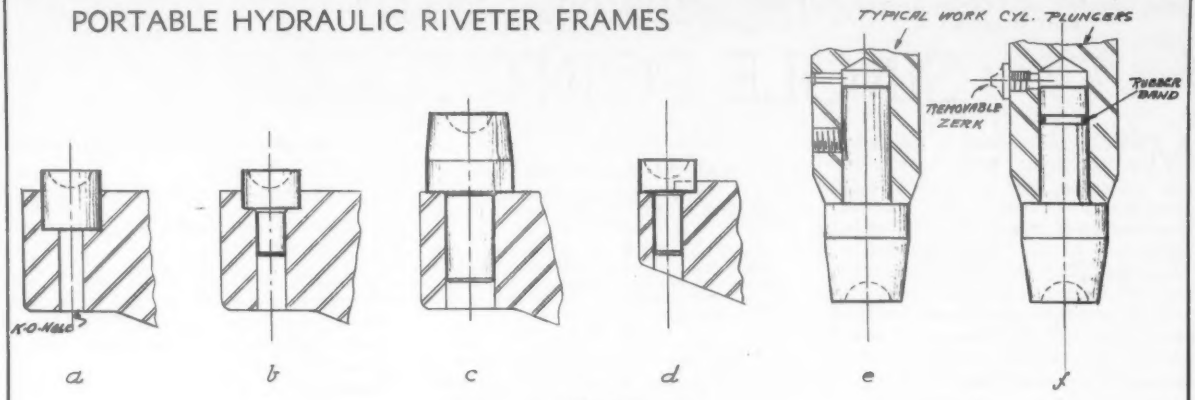

Figure 6.

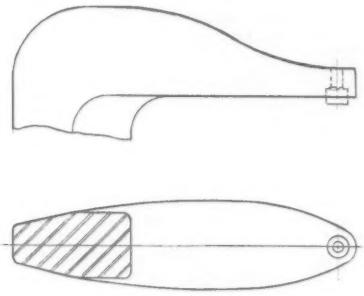

Figure 2.

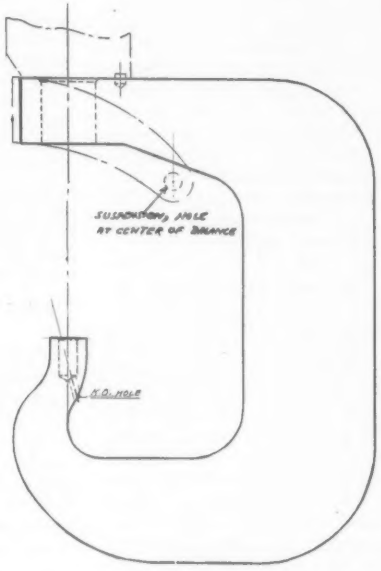

Figure 5.

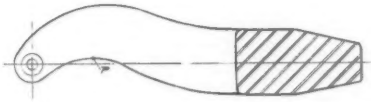

Figure 3.

Figure 4.

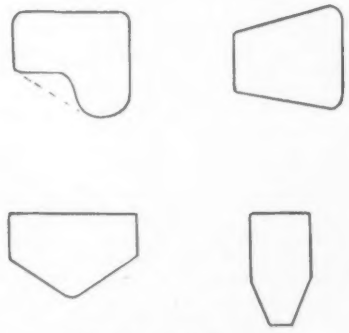

Figure 7.

MACHINING WITH SINGLE POINT TOOLS

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* Condensed from three lectures by the author delivered before the Educational Committee of the Cincinnati Chapter of the American Society of Tool Engineers.

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MANY investigations in the field of metal cutting have been carried out since the time of F. W. Taylor,[1] resulting in abundant data. These data, however, refer often only to the special conditions of the tests and are not correlated. The progress made in recent years permits deducing from these tests generalized cutting laws for single point tools, and building up a scientific system from which principles can be drawn for practical application.

Cutting Speed—General

The heat of cutting is injurious to the tool, blunting and finally destroying it. The heat is caused by the overcoming of molecular cohesion in the work material, by friction between the work and the flank of the tool. For practical use in shops and designing offices, cutting speed values have been determined and are included in many engineers handbooks. The limits of these values are often so wide, however, that they do not permit accurate calculation. The wide limits are due to the large number of factors which influence the cutting speed and tool life.

For example, the dimensions of the chip are often not taken into consideration in many tables for the cutting speed. This defect was well known to F. W. Taylor, but in spite of his investigations adequate cutting speed tables are still absent in general practice. The formula which he developed is too complicated for practical application. We need formulae which, on the one hand, are accurate enough to give reliable values, and which on the other hand can be easily used by engineers. For shop practice, diagrams or instruction sheets can be prepared from such formulae.

The cutting speed is not a constant value even for the same material and tool as assumed in many tables in handbooks. In such tables, distinction is made between a "roughing cut" and a "finishing cut." These are very inexact concepts. Opinions as to what roughing and finishing may be, are different in different factories. Production engineers in the heavy industries will often take for finishing, what will be considered roughing by makers of precision machinery. There is no "boundary" between roughing and finishing, owing to the gradual changing of roughing into finishing by the diminution of the dimensions of chip.

Different investigators have correlated the cutting speed with different variables, namely: (1) With depth of cut and feed per revolution as separate variables, (2) with chip-cross-sectional area, which is the product of depth of cut and feed per revolution, (3) with tool life and (4) with horsepower developed at the cutting edge. The first three relationships express conditions which are directly related to one another while the fourth one is related to the fundamental law of mechanics, namely: power equals force times velocity. The fourth relationship is very important but often forgotten. It will be seen later on that this relationship furnishes the key to a better understanding of the complex metal cutting laws. It permits—together with the other relationships—to develop the basic diagram which may be compared as to its importance and limitations with the Iron-Carbon diagram in the field of metallurgy. This diagram will be discussed later.

Note: References indicated by small numerals throughout this text will be given in the concluding article of a series on this subject.

Cutting Speed as a Function of Chip Cross Sectional Area

While many investigators have considered it necessary to treat separately the effects of depth of cut and feed per revolution, such a method when used in conjunction with the limitations by Item 4, above, results in a very complex procedure. Great simplification is possible by combining these two variables into their product (chip cross sectional area) as tests have proven that this is the main variable upon which commercially desirable cutting speed depends; provided, of course, that the material to be cut and the tool both remain the same, and that the ratio of feed to depth does not depart greatly from practical values. The bigger the area of the chip, the lower must be the cutting speed. The dependence of cutting speeds on chip areas alters for different materials; its variation is greater for light alloys than for cast iron.

Plotting cutting speed values (v in ft./min.) as a function of chip cross sectional areas (A in sq. in.) on bilogarithmical papers reveals that this function is a straight line. It descends from left to right, as in Diagram 1. This leads to the following form of a cutting speed law:

$$v = C_v \cdot (1000A)^{-E_v} \qquad (1)$$

This may be described as the first cutting speed law or "tool law," where:

C_v = a constant depending upon material, tool, tool life, and cutting fluid (and to some degree upon the shape of chip)

E_v = exponent depending upon the material to be cut.

A = Chip cross section in .001 in.^{2} or $\frac{\text{sq. in.}}{1000}$

v = cutting speed ft./min. for some definite tool life.

Numerical values for C_v and E_v respectively are given in Tables I and II. They have been computed from tests made by different investigators in this country and abroad. The method of determining C_v and E_v permits moreover of the comparison of tests from different investigations. The greater E_v, the greater is the influence of chip area variation on the cutting speed variation. C_v increases if cutting fluids are used and decreases if a longer tool life is desired. Tool life is understood to be the cutting time of the tool between successive grindings.

The use of the cutting speed formula (1) will be clear from the following example:

Required: Cutting speed for turning SAE 1035 with a high speed tool 18-4-2, the area of the chip being $A = 0.13$ square inch, a cutting fluid being used, and the desired tool life being $T = 60$ minutes.

Procedure: (Table I) $C_v = 230$
$E_v = -0.41$

Therefore, $v = 230\ (13)^{-0.41} = 80$ ft./min.

This equation can be solved with the aid of a bilogarithmic slide rule, or graphs can be prepared which permit of a direct reading of the cutting speed for different materials, tools and chip cross sections. Such graphs shall be discussed now.

The easiest method to draw diagrams for the relationship between chip cross sectional area A and cutting speed v is by means of the values of Table I. In it is given the cutting speed for $A = 0.001$ in.^{2} (C_v) and for $A = 0.01$ in.^{2} as calculated from the formula: $v = C_v \cdot (1000A)^{-E_v}$

Example: Draw cutting speed line for SAE 1035 for tool life 60 min. with cutting fluid:

Procedure: From Table I, Column 2, $C_v = 230$
From Table I, Column 6, $^{v}10 = 89.5$

Draw a line through $v = 230$ on $A = 0.001$ in.^{2} and $v = 89.5$ on $A = 0.01$ in.^{2}. (See Diagram 1 where several other examples are given.)

Having the line, it is possible now to read any cutting speed "v" for any chip cross sectional area, "A." For example: (SAE 1035) $A = 0.0075$, $v = 100$; $A = 0.0046$, $v = 120$, etc.

Diagram for Chip Cross Sectional Area

It is often convenient to dodge the calculation of the chip cross sectional area by use of a diagram which shall be prepared hereafter. It permits to read chip cross sectional areas A directly

TABLE I

Numerical Values for "C_v" and "E_v" for Cutting Speed Formula: $V = C_v \cdot [1000A]^{-E_v}$

Metal to be Cut	"C_v" *For 18-4-2 High Speed Steel Tool and: Tool Life 60 m. without coolant or 480 min. with coolant	Tool Life 60 min. with coolant	Tool Life 480 min. without coolant	"E_v"	Index Table For Convenient Plotting of Cut.-Speed Lines: Tool Life 60 m. without coolant or 480 min. with coolant	Tool Life 60 min. with coolant	Tool Life 480 min. without coolant	10^{-E_v}
Light Alloy	2160†	...	...	—.73	404	...	...	$\frac{1}{5.4}$
Brass (80—120 Brinell)	575	...	...	—.62	138	...	...	$\frac{1}{4.16}$
Cast Brass	365	...	...	—.44	133	...	...	$\frac{1}{2.74}$
Cast Steel	131	182	91	—.36	57	79	39.5	$\frac{1}{2.31}$
Carbon Steel:								
SAE 1015	258	360	180	—.41	100	140	70	$\frac{1}{2.57}$
SAE 1025	206	288	144	—.41	80	112	56	$\frac{1}{2.57}$
SAE 1035	164	**230**	115	—.41	64	**89.5**	45	$\frac{1}{2.57}$
SAE 1045	131	182	91	—.41	51	71	36	$\frac{1}{2.57}$
SAE 1060	84	118	59	—.41	32.7	46	23	$\frac{1}{2.57}$
Chr. Ni.—St.	141	198	99	—.57	38.5	54	27	$\frac{1}{3.66}$
Cast Iron:								
100 Brinell	187	260	130	—.28	98	136	68	$\frac{1}{1.91}$
150 Brinell	119	168	84	—.28	62.5	88	44	$\frac{1}{1.91}$
200 Brinell	67	94	47	—.28	35	49	24.5	$\frac{1}{1.91}$
	Figures are cutting speeds in ft./min. for a chip cross sectional area of A = .001 in.²				Figures are cutting speeds in ft./min. for a chip cross sectional area of A = .01 in.²			

* Corrections for other tools see Table II.
† No cutting fluid if turning light metals.

TABLE II

Corrections of "C_v" for Different Compositions of Tools

Type	Approx. Composition % W	Cr	Va	C	Co	Mo	Multiply C_v by
14-4-1	14	4	1	.7 -.8	..	..	.83
18-4-1	18	4	1	.7 -.75	..	..	.94
18-4-2	18	4	2	.8 -.85	..	.75	1.0
18-4-3	18	4	3	.85-1.1	..	..	1.08
18-4-1 + 5% Co	18	4	1	.7 -.75	5	.5	1.11
18-4-2 + 10% Co	18	4	2	.8 -.85	10	.75	1.28
20-4-2 + 18% Co	20	4	2	.8 -.85	18	1.0	1.33
Cemented carbide tools							up to 5

Formula for determination of "C_v" if "T" min. tool-life are required instead of 60 min.:

$$C_T = C_v \cdot \sqrt[n]{\frac{60}{T}}$$

for any feed (f) and depth of cut (d) and is derived from the formula: $A = d.f.$

We mark on a bilogarithmical chart (Diagram 2): (1) Chip cross sectional area (A) on the x-axis for values from .0003 sq. in. to .1 sq. in., (2)* Feed per revolution (f) on the y-axis for the following values: $\frac{1}{64} = .0156$; $\frac{1}{32} = .03125$; $\frac{3}{64} = .04675$; $\frac{1}{16} = .0625$; $\frac{3}{32} = .09375$; (3) the lines for various values of the depth of cut (d) are obtained in the following manner: We take the x-axis as the "marking line" (it correspondes to a feed of .01"); then we have: $A = f \cdot d = 0.01\ d$, resulting in the following table:

* NOTE: Decimal figures for the feed/rev. are omitted on Diagram 2.

Depth of Cut d	Lines for depth of cut "d" ascending under 45°, start on the x-axis from A=
$\frac{1}{32}$	.0003125
$\frac{1}{16}$	.000625
$\frac{1}{8}$	.00125
$\frac{3}{16}$	.001875
$\frac{1}{4}$	.0025
$\frac{3}{8}$	.00375
$\frac{1}{2}$	.005
$\frac{5}{8}$	.00625
$\frac{3}{4}$	.0075

Example for the use of Diagram 2. Problem: To determine the chip cross sectional area A for $\begin{cases} f = \frac{1}{32} \text{ feed/rev.} \\ d = \frac{3}{16} \text{ depth of cut.} \end{cases}$

Procedure: Go horizontally from $f = \frac{1}{32}$ to $d = \frac{3}{16}$ and vertically down to $A = .0058$ sq. in.

Certain limits are encountered in practice as to the common combinations of feed and depth of cut. We know, for example, that a feed of $\frac{3}{32}$ will not be used if the depth of cut is $\frac{1}{32}$. The ratio of feed over depth of cut does usually not exceed 1:2 (as a maximum). The common range is even smaller, namely between 1:5 and 1:10. We have to find lines for these limits. The mathematical derivation shall not be given here, but the procedure only.

Connecting the point A = .002 on the x-axis with the intersection of A = .02 and $f = \frac{1}{32}$ gives the line for the ratio of f:d = 1:20. Drawing a parallel to this line through

A = .001 gives the line for the ratio of f:d = 1:10
A = .0005 gives the line for the ratio of f:d = 1:5
A = .0002 gives the line for the ratio of f:d = 1:2

These "Ratio" lines intersect the d-lines, and only the part between them needs to be taken into consideration in actual practice for determining the chip cross sectional area.

Cutting Speed as a Function of Tool Life

Taylor showed that the relation between the life of a high speed steel lathe tool and the cutting speed could be represented approximately by the empirical equation

$$VT^n = C_T \qquad (2)$$

in which V = cutting speed (feet per minute)
T = tool life (minutes)

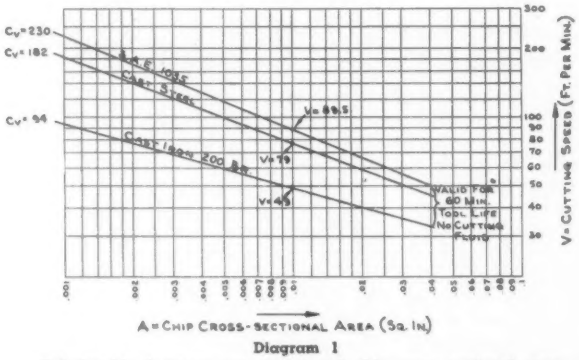

C_v = 230
C_v = 182
C_v = 94
SAE 1035 Chas. Steel
Cast Iron 200 Brin
V = 89.5
V = 79
V = 45
VALID FOR 60 Min. TOOL LIFE No CUTTING FLUID
V = CUTTING SPEED (FT. PER MIN.)
A = CHIP CROSS-SECTIONAL AREA (Sq. IN.)

Diagram 1
Relationship between cut—speed and chip cross sectional area.

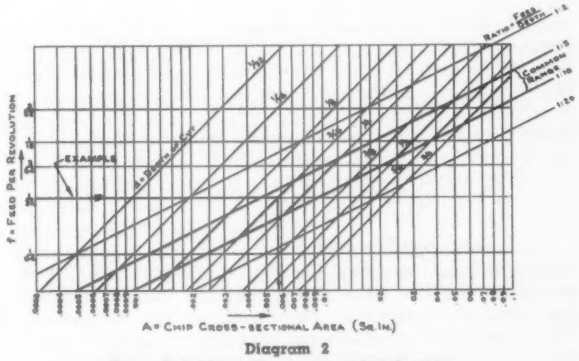


Diagram 2
For calculating chip cross sectional area

C_T = cutting speed constant corresponding to 1 minute tool life; it is dependent for its value on the exact cutting conditions other than speed. It will vary with the composition, form, size and treatment of the tool, the material cut, the size and shape of cut, and the cutting fluid.

n = constant representing the variation in tool life with cutting speeds the value of which also depends on factors such as tool material, material cut, size and shape of cut, and cutting fluid.

It is convenient to represent the cutting speed—tool life relationship graphically on logarithmic coordinates, whereupon it takes the shape of a straight line of slope n.

This empirical relationship between tool life and cutting speed in turning was confirmed by the Lathe Tool Research Committee [2] with high speed tools and by the National Bureau of Standards for cutting 3½ per cent nickel steel with high speed steel tools for both roughing [4] and shallow cuts [7] and with cemented tungsten carbide tools for roughing cuts [8] and by many others. [6] [10] [14]

be taken not to lay too much importance on the change of "n." A value of $n = \frac{1}{8}$ as against $n = \frac{1}{6}$ results in a permissible increase in cutting speed of only 20%, while a change in chip cross sectional area has a considerably higher effect—of sometimes several hundred percents—on tool life as will be seen later on.

The formula for C_T for tool life other than 60 minutes (as given in Table II), is derived from formula 2.

Diagram 3 has been prepared for an easy determination of the change in cutting speed if the tool life shall be changed and vice versa.

Example: Required the necessary cutting speed for 1000 minutes tool life in the case that a cutting speed of 80 ft./min. gives an endurance of 60 minutes.

Procedure: Trace from point "80" ft./min. in the scale up to the Tool Life line "60 min." (arrow a) go horizontally to the tool-life-line for 1000 min. (arrow b) and read the result (arrow c) in the scale; 50 ft./min.

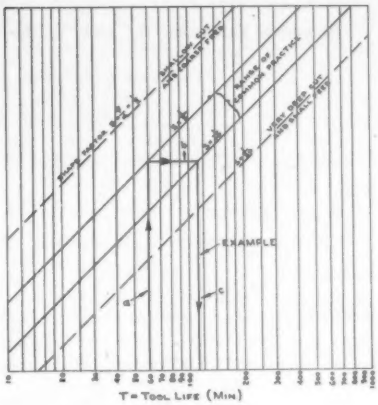


Diagram 3
Effect of change in cut speed on tool life.

Cutting Speed as a Function of Depth of Cut and Feed/Rev.

Formulae for the cutting speed in which the feed and depth of cut are given separately are usually presented [4] in this form:

$$v = C \cdot d^{-x} f^{-y}$$

which can be transformed into

$$V = \frac{C}{A^{\frac{1}{2}(y+x)} \cdot S^{\frac{1}{2}(y-x)}} \qquad (3)$$

where A = area of cut, and S = shape factor $\frac{f}{d}$ (or ratio of feed over depth of cut)

d = depth of cut
f = feed/rev.
y, x = exponents

this formula being valid for 60 min. tool-life if the constant C is determined accordingly.

This transformation indicates very clearly that the area A of the chip is of a considerably greater effect on the cutting speed than the shape S, since the exponent of A is composed of the sum of y and x, while the exponent of S derives from the difference y — x.

Formula 3 shows furthermore, that each cutting speed line (Diagram 1) could be split up into several parallel lines for different values of the shape factor S, which in actual practice—in turning—varies approximately between the limits of ½ and 1/20, and usually only between ⅛ and 1/10.

The effect of a change in the shape factor on the tool life, for a given area and cutting speed, may be found by combining Formula 2 with Formula 3,

whence: $T_a = T_b \left[\frac{S_b}{S_a}\right]^{\frac{1}{2u}(y-x)}$

Where T_a and T_b respectively represent the tool life for shapes S_a and S_b.

Diagram 4 is a graphical representation of this formula and shows the effect of change in the shape of chip area on endurance. The arrows refer to an example viz: If the tool life is 60 min., for a shape factor $S = \frac{1}{5}$, what will be the endurance if the shape factor is changed to $S = \frac{1}{10}$? The answer (follow arrows a — b — c) as indicated is 112 min. Furthermore, it will be seen in general that tool life increases slightly if a deeper cut and a small feed is used, and decreases slightly in the case of a shallow cut and a coarse feed.

(To Be Continued)

TABLE III

Numerical Values for Exponent "n" in Formula $V \cdot T^n = C_T$

Author	Material	Tool	"n"
Taylor	Plain carbon steel 70,000 tensile strength	19% C; 2% Cr; 8.5% Wo	1/8
Digges, French	3½% Ni steel	cemented carbide	1/5
Digges, French	3½% Ni steel roughing	high speed steel	1/7
Digges, French	3½% Ni steel shallow cuts, dry	high speed steel	1/10
Digges, French	3½% Ni steel shallow cuts lard oil	high speed steel	1/8.7
Digges, French	3½% Ni steel shallow cuts water	high speed steel	1/7.6
Boston	SAE 3140 dry	high speed steel	averaged 1/7.8
Boston	SAE 3140 lubricat.	high speed steel	averaged 1/7.8
Schlesinger - Kronenberg	cor. to SAE 3325	high speed steel	1/5.4
Schlesinger - Kronenberg	cor. to SAE 1045	high speed steel	1/6.6
Judkins and Wecker	SAE 1040 dry	cemented carbide	1/6.4
Judkins and Wecker	SAE 1060 dry	cemented carbide	1/6.0
Judkins and Wecker	SAE 2335 dry	cemented carbide	1/6.2
Judkins and Wecker	High carbon—high chrom.—steel	cemented carbide	1/6.4

Values for the exponent n are given in Table III. It will be seen, that "n" varies with different materials, although no general rule can be found either as far as the tool, the material, or the cut is concerned. This may be due to differences in determining the instant at which the tool is considered to be dull, and also to changes in type of chip flow under changes in cutting conditions.[17] A scientific method of determining the instant of tool dulling was discovered in 1913 by Schlesinger[15], viz: the sudden increase of the horizontal components of the cutting pressure. For practical purposes the value n may safely be assumed as ⅙, due to the fact that a variation of n from ⅕ to 1/10 has only a slight effect on the result.

The ideal condition would be an exponent n = o, meaning that tool life would be infinite; since this is out of the question the aim must be to reduce "n" as much as possible by coolants, etc. But, on the other hand, care must

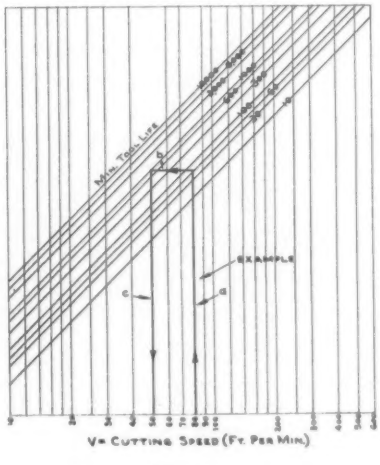


Diagram 4
Effect of change in chip-shape on tool life.

No Guesswork In
AIRPLANE BUILDING

LIGHTNESS and strength are two prime requisites of the structure of an airplane. Everyone knows that. But not many persons have a very clear notion of what a lot of mathematics and engineering skill, to say nothing of manufacturing technique, are used to get these into modern high-speed transport and military airplanes. It is a combination of which they can't have too much.

And after the mathematician, the designer, the engineer have done their best, it is a question of the soundness of the materials which determines whether anticipated performance will be realized.

Fortunately, there are many ways in which the manufacturer can protect himself and his customers from the possibility of incorporating bad material into structures which must be sound if lives are to be safe. None of these are neglected by Lockheed Aircraft Corporation. But to all such standard practices, this company — builder of the Howard Hughes' round the world plane and of the world's fastest transport airplanes—has added another.

Probably no industry in the world needs to know so much about so many different materials as does the aircraft industry. A standard 14-place Lockheed transport contains a total of 229,274 separate parts. They range from fabric, wood, glass, rubber, plastics through just about all the structural metals. In addition, the power installation involves from 5,000 to 6,000 parts and there are approximately 2,481 feet of wiring in each plane.

X-Ray Equipment Specially Designed

In order to be one hundred per cent sure that all these parts, in so far as they enter into the structure of its planes, are sound and without internal defects, the Lockheed company, at its factory in Burbank, California, is making the most extensive use of the X-ray known to industry. With the only equipment of its kind—the only X-ray equipment specifically designed for the aircraft industry—the company literally looks through all metal parts which enter into the primary structure of its airplanes before they go into the planes. This special equipment was built at a cost of in excess of $150,000 and is among the most powerful used in metallurgical work.

Just as a dentist X-rays teeth for imperfections or a doctor looks at a fractured bone, metallurgical experts at the Lockheed factory explore the interior of the materials to be used in the construction of airplanes. Three of the specially designed X-ray machines are installed in as many carefully lead-lined rooms and are kept constantly busy. Three thicknesses of lead sheeting line the walls of the room housing the most powerful of these machines, lead being the one practicable metal equal to the task of stopping these rays so dangerous to human tissue when produced in this quantity.

With the aid of these powerful eyes, a continuous stream of aluminum alloy castings, forgings, welded parts and other structural members are scrutinized for cracks, porosity, shrinkage, inclusions of foreign matter or other internal imperfections which would impair strength.

As each part comes into the testing laboratory it is given a number, which is stamped into the metal by a pneumatic tool designed for that purpose. It is then radiographed, the film being numbered at the time of exposure, so that a permanent record is available of every part which goes through the laboratory.

No X-Rayed Part Has Failed In Service

So successful has this procedure proven that, to date, there has not been a single failure of an X-rayed part. It is the last word in protection of the airplane user, since every part which enters into the primary structure of a Lockheed plane, failure of which would cause grounding or failure of the machine as a whole, is completely X-rayed. That is, on a complex casting, for instance, radiographs are made from as many angles as may be necessary to reveal the entire internal structure.

This does not mean that less important parts are neglected. Even the latch to the door of the cabin, the fire extinguisher holder, and other similar details take their turn under these penetrating rays. A total of more than 600 item-classifications is X-rayed for each type of plane built, which means a much larger number for each airplane, since there are multiple units under many of the item-classifications. At the current rate of production, something like fifteen to twenty thousand parts a month are examined. Smaller parts are radiographed in groups to save time and film. But the monthly film consumption at Lockheed is far in excess of that in any other industrial application of the X-ray, either in this country or abroad.

A metallurgist trained in the art of radiography can readily detect any variation in the internal structure of a metal part from the radiograph. He not only can do that but he also knows the precise significance of the variation. Formulas developed through the pioneering work of T. A. Triplett and Vic Barton, who have charge of the Lockheed laboratory, and by others, make it possible to calculate the exact strength of a metal part from its radiograph.

Other methods of testing materials, such as sectioning, tensile and compression tests, involve destruction of the part or material tested. Use of the X-ray, however, makes it possible to test the exact part which is incorporated into the plane. Strength tests which pull or push at a part until it fails are not, naturally, done away with. Tests of this kind assume that the part tested is a standard or normal one, and that the parts which are actually used in the planes are duplicates. Testimony of the penetrating light of the X-ray establishes beyond question that each individual part is what it is supposed to be.

Reveals Defects Of All Kinds

Not only are all ordinary internal defects in the material revealed by the X-ray examination. The X-ray also reveals features of that internal structure not readily detected by any other means. For all routine or ordinary purposes, the exposed X-ray film is all that is needed in this modern addition to the construction of aircraft. The special equipment at the Lockheed factory makes it possible to discover defects much smaller than is possible with the usual equipment, which is an adaptation of X-ray equipment originally designed for medical use. The advanced Triplett and Barton methods will uncover imperfections down to as small as one-tenth of one per cent of the thickness of the part examined. Imperfections smaller than that are of no practical consequence so far as efficiency of the member is concerned.

But for special purposes, the X-ray will go far beyond the strongest microscope in its probing of the structure of metals or other materials. By spectroscopic analysis it can be made to show the ultimate pattern of the atoms in space, thus aiding in the solution of a variety of problems outside the scope of this article.

The work of the Lockheed testing laboratory, one of the most complete, if not the most complete in the aviation industry, is not, of course, to be confused with inspection. Every department of the factory has its qualified inspectors, who examine each part as it is fabricated to see that it meets the exacting requirements imposed by the nature of the business.

Variety Of Services

In addition to the routine examination of this fast-flowing stream of parts going into the Lockheed transport and military airplanes, the X-ray equipment

(Continued on page 52)

IT'S NEW

With increased demands on Industry, and machine tool builders quoting future deliveries—if any—it is essential that management gravely consider the latest and best in cost saving equipment. THE TOOL ENGINEER scrutinizes new equipment through the eyes of trained men. While the outlines are brief, that we may cover a wide field, we suggest that our readers write or contact the makers, mentioning this publication. They will gladly furnish complete information to those interested.

Cerromatrix, an alloy produced by the Cerro de Pasco Copper Corporation, 44 Wall St., New York, N.Y., and adaptable to many uses, has been successfully combined with a simple holder to produce Unique Speed Chucks. According to Paul Leo, of Precision Mechanical Laboratory, New York, Cerromatrix is melted into the holder, or chuck body, to the exact shape of any irregular part within its range, the combination forming an accurate, wear resistant and speedy special chuck for odd shapes.

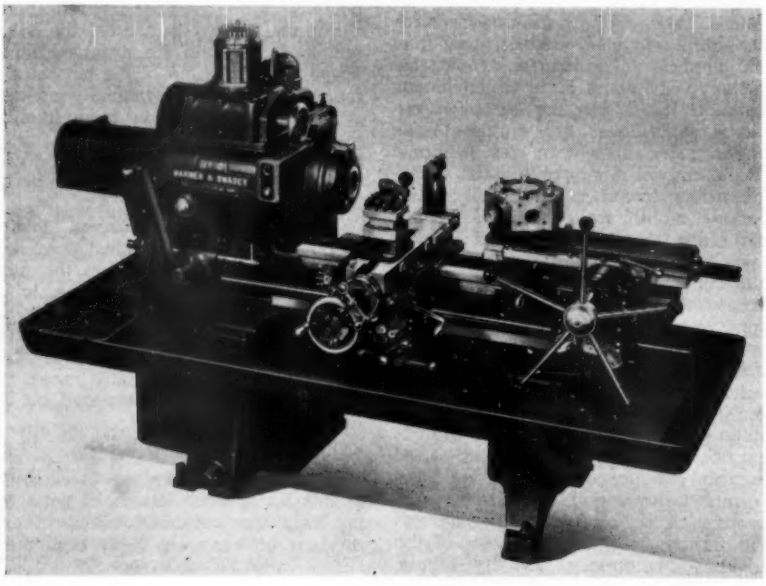
Heretofore, one had to resort to special chucks, or use four jaw chucks for rectangular sections. The first entailed considerable expense, since only one chuck served a shape; the second was slow, cumbersome, necessitated truing up each part and has been costly on small production runs that did not warrant special tools. But now, one merely centers the work in the Unique Speed Chuck body, pours melted Cerromatrix into it, and there is the tool, ready to produce. One can hold work central or offset, as the case may be, and the tool is nicely suited to tapers, pinion rod and other shapes. While the tool described has a taper shank, to fit in lathe spindle, it is apparent that the material can also be used to adapt draw-in chucks for turret machines and precision lathes, as well as for index milling. In fact, the versatile mind can conceive innumerable uses for Cerromatrix, especially in vises and holding fixtures. We advise our readers to acquaint themselves with the Chucks shown in the illustration, as well as the possibilities of the alloy. Write the maker for detailed information.

Warner & Swasey Company, Cleveland, Ohio, announces a new No. 4 ram type Turret Lathe which has a host of new improvements, among which are included a more rigid bed, a head brake and superior head lubrication. The machine has a bar capacity of 2", (larger than previous No. 4) and 18⅛" chucking swing. And where, heretofore, a pre-selector was available as optional equipment, it signalled its definite establishment as an easily operated, cost reducing and time saving unit. Hence, the new No. 4 is equipped with pre-selector head only. With this unit, originally introduced by W & S at the '35 Show, only one lever is required to shift the gears, instead of two, three or four, and cutting operations are placed on a complete surface-feet-per-minute basis which greatly simplifies operation of lathe. To further facilitate gear shifting the shifter fork now operates on a hub on the shaft, not on outside diameter of gear teeth, as formerly.

Instead of conventional box type ribbing, the new design incorporates diagonal ribbing similar to bridge truss bracing, the change increasing the rigidity of the bed almost 30 per cent. This is an important consideration in maintaining accuracy during extreme cutting conditions. This construction also adds considerably to clearance space for chips as they fall into the pan, quite important as the rate at which metal is removed increases.

The head of the machine is lubricated by a new forced-feed system. With oil stored in a reservoir in the base of machine, the lubricant is kept considerably cooler than in the splash system. A spindle brake, another new feature, is an improved type that can be released after the spindle is stopped to allow positioning of chucks and fixtures. The universal cross slide and hexagon turret offer maximum opportunity for combined cuts: there are six reversible power feeds, both cross and longitudinal, for the universal cross slide. All feeds increase uniformly to provide a proper range for all classes of work. The square turret, on cross

New No. 4 ram type turret lathe announced by The Warner & Swasey Company, Cleveland, Ohio. It has a 2" bar capacity and an 18⅛" chucking swing. The pre-selector is standard equipment. Rigidity of the bed is increased almost 30 per cent by a new design that features diagonal ribbing, similar to bridge truss bracing, instead of conventional box type ribbing. An automobile hub in place in the Budd induction heat treat machine, just after the hardening operation has been completed. The head of the machine has been lowered into the barrel of the hub, bringing the surface of the bore to a high temperature by means of electrical induction, and then withdrawn as water is forced at high pressure through a quenching fixture to complete the hardening operation. The whole operation is completed within a few seconds.



"Cerromatrix," an alloy, has been successfully combined with a simple holder to produce a Unique Speed Chuck. The alloy is melted into the holder, or chuck body, the combination forming an accurate, wear resistant and speedy special chuck for odd shapes.

slide, indexes automatically and the large dial has widely spaced graduations for accurately measuring depth of cut. A plunger oil pump on cross slide thoroughly lubricates both slide and bed bearings.

The hexagon turret is equipped with adjustable stops for automatically tripping the feed for each turret face, and the turret may be indexed, or "spun" in either direction to skip tool stations. The turret revolves on an adjustable tapered roller bearing center stud, while adjustable tapered gibs at side and top of turret slide assure proper fit under all conditions. Hardened replaceable plates under the slide "wear proof" the unit. Motor and drive are completely enclosed in a cabinet leg directly under head end of machine, while doors on either side permit ready access to the motor. Multiple vee belt equipment is furnished standard. Description and picture of the machine intrigue the interest; it should be looked into.

Budd Induction Heating, Inc., subsidiary of Budd Wheel Company, has developed a new method of heat treating metals by electrical induction which makes possible the hardening of inside diameters of cylinders and other bores. The process is being successfully used in production work at Budd Detroit plant, where, in regular operation, a "one shot" type of head is used to harden the bore of automobile hub forgings, thus making the roller bearing race an integral part of the hub. In this application, the treated area is hardened to 58-64 Rockwell "C". It is claimed that about two million pieces have been turned out on these machines during the past three years, without a failure being reported.

While present equipment is applicable to diameters 2 to 7½ inches, and lengths up to 30 inches, it is possible to treat bores from two inches up and upward of fifty feet in length. Induction heat treatment is applicable to all ferrous metals of suitable analysis, includes any material that may be hardened, drawn, tempered, annealed or normalized by methods generally used. Like all new things, the method opens a wide vista in future production methods.

Claimed by the makers to be the "Machine of the Month," the DOALL High Precision Surface Grinder can be said to be two machines in one. By interchanging heads, the basic machine can be adapted to the new standards of accuracy and finish required of surface grinders, or the versatility demanded of cutter grinders. The machine is of rugged, modern design and construction, with interesting features, as will be seen from the illustration. The chuck has permanent magnets, so that no electric current is necessary to hold work; besides, a "cold light," placed to enable operator to see work without eyestrain, also reduces distortion of work from heat generated by conventional lamps. The machine is the product of Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis. Descriptive bulletin on request.

Rivett Lathe & Grinder, Inc., Brighton (Boston), Mass., announces the new Rivett 918 to advance the productive capacity of the plain precision bench lathe. An indispensable tool room machine, the precision bench lathe has a decided value in production, replacing heavier and costlier machines on many items in mass manufacture. The Rivett 918 is the heaviest bench lathe available, is rigidly constructed and mounted to be free from vibration at high spindle speeds. It has the following dimensions and features:

Headstock, with 9" swing, takes draw-in or push-out collets up to 1" capacity. Ball bearing spindle 15⅝" long with long taper key drive nose. Complete electrical control for spindle speeds 100 to 3750 r.p.m.; starting time to full speed and stopping time from full speed within one second. A Rivett product that, with various attachments, can be put to a very wide range of use on precision and mass producion. A very complete Bulletin (918) is replete with information and ideas for various uses of the tool.

The Dumore Company whose light, accurate, self contained grinding attachments have solved many a problem for jobbing shops as well as manufacturing plants, is out with a new Dumore KD Motor, a well designed unit widely applicable in the industrial field. Double reduction geared, the armature shaft delivers approximately 1/10 H.P. at 7000 R.P.M., torque increasing in ratio to reduction. Ratios range from 99—1 to 1024—1; unit can be furnished for 115 v. 60 cycle A.C. or 115 v. D.C. Provided with a flanged face and centering boss, it can be neatly and rigidly mounted; fastening is provided for by four holes in flange. Dumore Bulletin 753 is replete with data as well as a cut showing all necessary dimensions. Write for it; it is a good filing size.

The George Scherr Co., Inc. announces a new 40" model of the Chesterman Height Gage which includes several exclusive features.

The new 40" model is equipped with three separate and distinct adjustments, namely, a quick-locking, a fine knurled knob at the head and a super-fine adjustment at the base.

The new tool is constructed with a triangular beam which results in unusual strength and rigidity and prevents sway and vibration giving accurate readings as high as 40". The tool is graduated in both English and metric scales to read to 1/1000" and 1/50 mm and comes with an extra large vernier, about 2½" long, a feature that enables the toolmaker and inspector to measure without the aid of magnifiers.

New Duall High Production Surface Grinder, claimed by the makers as "The Machine of the Month," is really two machines in one. By interchanging heads the basic machine can be used for accurate surface grinding, while it has at the same time the versatility of a cutter grinder.

Showing, below, a new method developed by the Budd Injection Heating, Inc. for heat treating metals by electrical induction, a method which makes possible the hardening of inside diameters of cylinders and other bores.

The new Rivett 918 recently announced "to advance the productive capacity of the plain precision bench lathe"—an indispensable tool room machine, and has a decided value in production for many items of mass manufacture. It has a 9" swing, takes draw-in or push-out collets up to 1" capacity.

Why Unemployment?

BY PHILIP LANG
MEMBER A.S.T.E.
CUTLER HAMMER, INC.
MILWAUKEE, WISCONSIN

IT WOULD be regrettable if the A.S.T.E. Fact-Finding Committeee's recently published findings were regarded as an intended white-washing of the machine-age theory. The Committee should be enabled at an early date to present factual data on the real cause of unemployment. The professional standing of its members would offer good inducement to other publications to approve and spread the statements, and so build up strong public approval.

Tool Engineers in general should participate in a movement to counteract the widely held idea that they, as creators of the machines, desire to justify the objective of their vocation without furnishing acceptable proof that technological progress does not rob the worker of his job. Being accustomed to analyze tool and machine performance from the standpoint of production economics, they should, by applied constructive imagination, be qualified to help in the search for the elusive functional trouble of the nation's economic machinery.

It is a recognized phenomenon in our economic existence that collective activity moves in cycles. But it is not so well understood that the purchasing power which supports collective activity is fluctuating according to consumer psychology which creates the expanding or contracting cycles, and is the result of emotional forces affecting the acquisitive instinct of the people. This creates expanding or contracting buying power with its effect on employment. But, while employment is visibly fluctuating with the cyclic activity, the causes of surplus unemployment must be sought in other obscure influences.

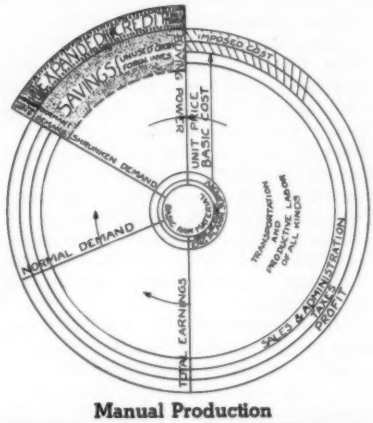
Acquisitiveness is a fundamental trait of humanity, but it is kept in check by the lack of ability to buy, or by diversion of buying ability into other channels.

Causes of Unbalance

The causes of unbalance are national in origin. Therefore, when visualizing the effects of purchasing power on production and, incidentally, employment, we may express productive activity of all kinds by a composite unit of production and the resultant total earnings therefrom, as buying power.

Tool Engineers, being acquainted with the expression, "To every action there is an equal reaction," may find it convenient to illustrate our composite unit of production as a circular picture, where the collective activities acting in one direction meet the collective earnings therefrom as buying power from the opposite direction, and also show some of the contributing factors which tend to upset the equilibrium of the opposing forces. Further, if we extend this theory to two pictures, one showing predominantly "Machine Production" and the other "Manual Production," we may recognize by analysis that although price and purchasing power would normally balance in both cases, the time taken by machine production is so much smaller that we are not forced to labor twelve hours a day, but are left with leisure in which to enjoy and appreciate the result of our machine age.

Machine Production



Manual Production

In analyzing the composite product, the price may be called a fair price if all the costs are fair! If any cost factor is increased unduly, the price becomes unfair to the extent of the unbalance, thereby lowering the useful value to the consumer and increasing the resistance to the buying urge. Possible causes of unfair price may be: inefficient plant, too high wages, overdeveloped sales effort, excessive taxes, too large profit, etc.

Normally, all correlative forces shaping the price are present on the opposite side as potential buying power; but if the useful value is lowered, an increasing proportion of the buying power is diverted, as will be pointed out later, and lowered employment results. Conversely, if the useful value is increased by lowering any cost factor, and especially the imposed cost, increased employment should result.

Inasmuch as the total earnings of all productive activities return as potential buying power, there should be a balance between price and buying power, and employment stay normal. But in addition to the factors named above which affect the useful value, there are diverting forces affecting the buying power. During expanding cycles the normal buying power is augmented by expanding commercial credit, due to larger volume of profits, larger applied income from investments, and eagerness to buy at any price, all tending to expand employment. Emotional excesses in this direction bring their corrective forces into play and start the contracting cycle.

Costs of living rising faster than earnings start a contraction of demand for consumer goods. This, in turn, impairs the activities of capital goods. Savings withheld from investment, tightening of commercial credit, etc., speed the downward spiral and spread unemployment.

Machine Economy No Cause for Unemployment

Thus we search in vain for proof that our machine economy is the cause of unemployment. As long as we keep in mind that higher costs tend to impair buying power, then it is true that lower costs due to machine production must improve it. And if lower production per worker or higher wages per unit of product increase the cost, then we must accept the theory that the remedy is not in the elimination of the machine, but in the ability of lowering the price, and by elimination or reducton of factors that impair the useful value to restimulate the desire of acquisition.

Taxation is a major factor in lowering the useful value of the things we buy. In theory all taxes quickly return as buying power, but being an imposed cost, such burden is an increasingly large factor in reducing the useful value. No doubt some of the other factors are susceptible to improvement, as, for instance, excessive selling costs. High-powered advertising may sell more goods, but the buyer pays for the excessive selling cost, and thus he gets lower useful value for his money.

Profits also reduce the useful value. But in our capitalistic society, profit is the only motive of production. This is as equally true of the man selling his labor as of the financier arranging a million-dollar loan. But very large profits, when accumulating in comparatively few hands, soon clog the desirable investment channels, and thereby defer

(Continued on page 48)

A higher Quality Finish
IN 50% LESS GROOVING TIME
with the new
WARNER & SWASEY QUICK ACTING SLIDE TOOL

A new Warner & Swasey Slide Tool made an immediate 50% time saving in grooving work at the Reeves Pulley Co., Columbus, Indiana. The work is on various types and sizes of cast iron bearing housings ranging in lots of 50 to 300 pieces. Typical examples of this work are detailed below. With the new slide tool the operator cuts grooves with less than a quarter turn of the handle, where five or six turns were required with the old style slide tool. The rigidity and smooth action of the tool allows faster feeds and produces a higher quality finish on each part.

If you have grooving operations, a new Warner & Swasey Quick Acting Slide Tool will cut your machinery time. You will find complete information on this tool on page 39 of your new Warner & Swasey Turret Lathe Tool Catalog. For prices on this tool, or further information, write

Here's the new Warner & Swasey Slide Tool for fast recessing and facing cuts. An ideal tool for inside facing cuts which must have a smooth surface. A large micrometer dial makes adjustments of cutters a big time saver.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS
...WITH WARNER & SWASEY TOOLS

Production Perspectives

News of Mass Manufacturing from Everywhere

The **outlook for the machine tool industry** for at least the first quarter of next year is **more satisfactory than has been the case at any time since pre-depression days. Wendell E. Whipp, president, The Monarch Machine Tool Company,** Sidney, Ohio, **states.**

"It is my own personal opinion," Whipp says, "that the **volume of machine tool sales and production will continue at a high level for some months to come.**

"I **base this belief chiefly upon two factors**—first, the strong **domestic demand** for machine tools upon the part of a wide variety of manufacturing enterprises, and second, the **defense needs** of the United States.

"In short, **even if the foreign market for machine tools,** which is now large, **should suddenly decline**—and in this time of bewildering developments in Europe the foreign demand for machine tools is, to say the least, unpredictable **—the need for machine tools here in our own country should** still **support a comparatively high rate of operations** in the industry, extending well into the new year.

"Trade figures show that increased employment is being reflected in increased public demand for products and devices which are **essential to our modern standard of living—household appliances, homes, clothing, automobiles, refrigerators, and the like.** When the manufacturers of these goods are busy they are good buyers of machine tools. It is upon the basis of growing public demand for more of the comforts and conveniences of living that I base my belief that the domestic market for machine tools for manufacturing purposes will remain for a substantial period at a good level.

"As to national defense—the **terror of power politics** in Europe and the **danger of war have awakened our democracy to its needs** in this vital direction. It is certainly probable that the **American people will endorse a plan for a better equipped army, navy and air force.** This program will require the services of machine tools.

"Barring some totally unexpected adverse development, I believe that we in the **machine tool industry** are **justified in assuming** that we **stand on the threshold of a substantial period of new development and expansion."**

▼ ▼ ▼

The **biggest November in history** both from the standpoint of factory sales and retail deliveries was **announced December 12 by the Studebaker Corporation. Studebaker's current quarter will be the most successful final quarter in point of unit sales since the company began manufacturing automobiles nearly 40 years ago. Factory sales in November totaled 11,487 passenger cars and trucks, bringing sales** for the 11 months **to 99,673 units, more than double sales of the same period of 1938.**

F. D. Newbury, economist of the Westinghouse Electric and Manufacturing Company, predicted December 12 that **business for heavy or capital goods industries in 1940 would "be 10 to 15 per cent better than in 1939."**

A $15,000 order from the Russian government was canceled by a Madison machine tool company December 10 **because of the Soviet's lack of "sportsmanship" in warring with Finland. Thomas E. Coleman, president of the Madison-Kipp Corporation, revealed $5,000 had been returned to the Russian government, and asserted: "Most corporations want to deal with nations that give a place to ethics and sportsmanship in political situations as well as in business transactions.** There are plenty of manufacturing concerns that will not need an embargo against shipments to aggressor nations after they have completed present commitments.

Employment and payrolls of factories in the state of New York registered a contra-seasonal gain in November, according to a report issued by the New York state department of labor. From the middle of October to the middle of November employment rose 0.9 per cent, to equal the level of September, 1937, the peak month since 1930, while payrolls gained 0.7 per cent to the highest level since March, 1930. This is the fourth consecutive monthly gain, and is contrary to the usual trend from October to November.

Gerard Swope retired as president of the General Electric Company December 31, but he will not retire from work, as he is the new chairman of the New York City Housing Authority. Swope, who reached General Electric's age limit of 65 the last of the month, was named to his new position fifteen minutes after he was appointed a member of the authority by Mayor La Guardia December 11.

The United States Steel Corporation reported December 11 it shipped to consumers last month the largest amount of finished steel products since May, 1937. With the industry operating close to practical capacity, **November shipments** of United States Steel **totaled 1,270,894 tons,** an **increase of 52,349 over the October figure** and **591,241 ahead of the November, 1938** total.

Kelsey-Hayes Wheel Company announced December 11 that approximately 3,500 employees next summer would be given vacations with pay based on two and a half per cent of their earnings in the 12-month period ending June 30, 1940. The **company** also **put into effect December 1 an efficiency program through which bonuses will be paid to hourly rated employees above 96 per cent efficient.**

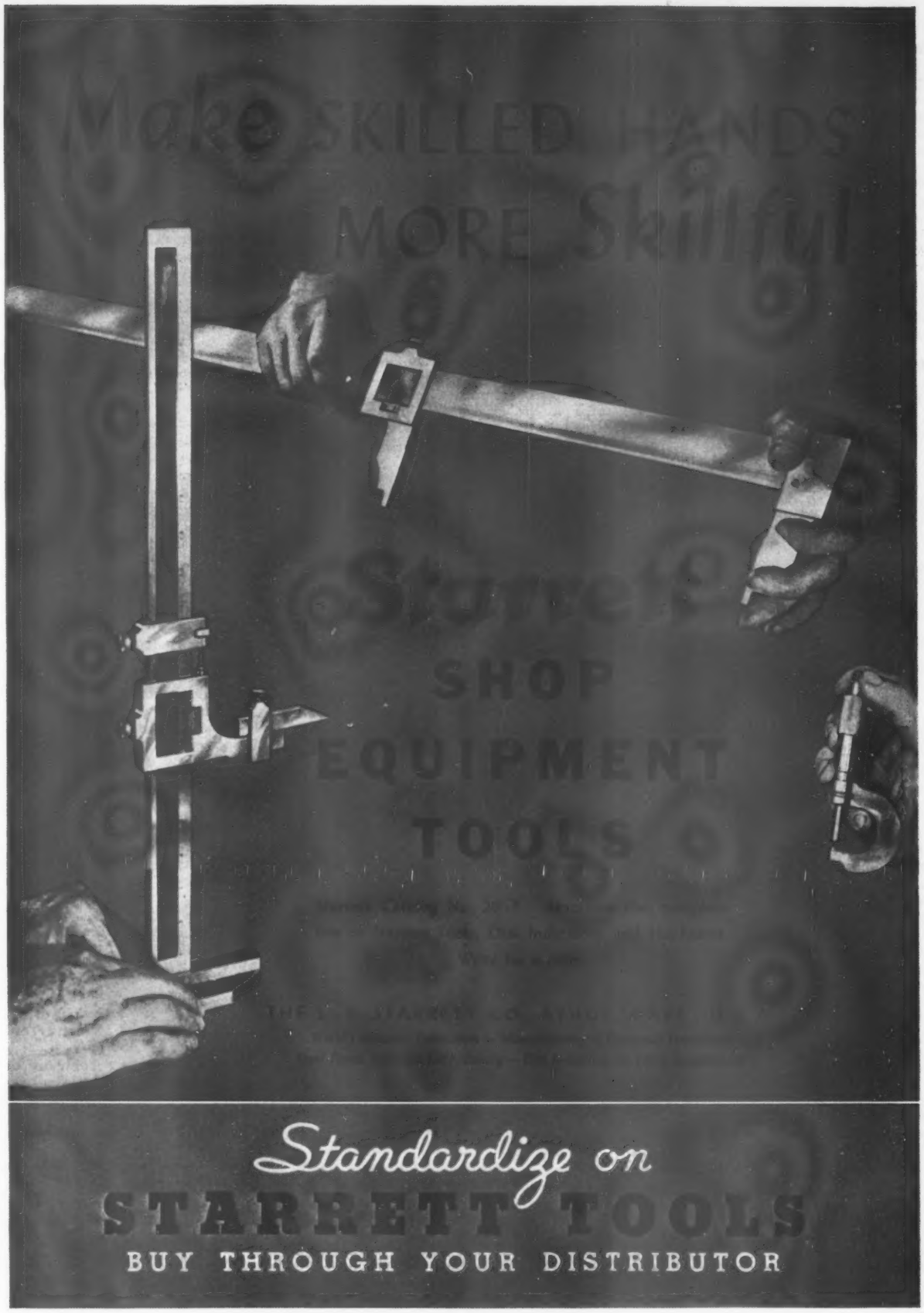
The Interstate Commerce Commission on Dec. 11 **authorized the New York Central Railroad Company to issue and sell to the Reconstruction Finance Corporation $9,000,000 of 2½ per cent equipment trust certificates.** The Commission stipulated that the **railroad must spend an additional $3,600,000 in the next ten months for repairs** to present equipment. The **road proposed buying 4,000 freight cars and 5 Diesel locomotives** at a **total cost of about $9,050,100.**

Production of nylon started Dec. 15, the E. I. du Pont de Nemours Company announced Dec. 11. Climaxing ten years' research, production began in an initial $8,500,000 plant at Seaford, Del., employing 850 persons.

The Cadillac-La Salle division of General Motors in November sold 4,450 units, best for the month in the thirty-seven year history of the company. On order at the factory **are 19,000 units, 20 per cent more than a year ago,** so fourth quarter production will be better than any previous production total.

Massachusetts industrial activity in October was 11 per cent **higher than** in the same month, **a year ago,** Miss Elizabeth M. Herlihy, chairman of the State Planning Board said in a report. **Electric power consumption was up 14 per cent** and the **number of industrial employes 10.8 per cent.** New orders received by Massachusetts factories continued their spectacular increase in October. The **index** prepared by Associated Industries **stood 41 per cent over October a year ago.**

An **increase in employment,** the **purchase of thousands of dollars worth of new machinery** and the **largest amount of domestic orders on hand since 1929 are bright spots** in the current business **of the Indian Motorcycle Company, Springfield,** according to E. Paul du Pont, president. "Since October 28 of this year, Indian Motocycle Company has increased the number of its employes by 100 per cent." Mr. du Pont said. **"Domestic orders on hand are 20) per cent above any period since 1929.** Our plant is one month behind in domestic deliveries." This activity at the Indian plant was explained by the introduction of a 1940 line of motorcycles which have been completely restyled, new mechanical improvements added and a new increase in interest in motorcycles from the sport and commercial markets alike.


Make SKILLED HANDS
MORE Skillful
SHOP
EQUIPMENT
TOOLS
Standardize on
STARRETT TOOLS
BUY THROUGH YOUR DISTRIBUTOR

Also **going strong and now employing 600 persons,** or 50 per cent more than a year ago, **is the Van Norman Tool Machine Company of Springfield,** which is becoming of increasing importance in this industrial area. **The company reported a backlog of orders amounting to around $1,500,000** of which foreign business accounts for roughly 50 per cent. Van Norman has received an order for an unannounced number of milling machines for use by the French government in aircraft manufacturing plants in France. In addition to awarding a contract for a new $30,000 addition to its plant, Van Norman has purchased a plot of land for $15,500 as a parking lot for employes' automobiles.

Another **concern which has doubled its payroll** within the last several months **is the Springfield Bronze and Aluminum Co.,** which currently is employing 100 men on two eight-hour shifts in capacity production. The concern is looking forward to an excellent winter season. **Joseph R. Gould,** president and treasurer, **said** that **the company is turning out many magnesium castings for airplane production** among other business.

The American Bosch Corporation, Springfield, is the busiest it has been in years and much of the present activity is traceable to indirect effects of the European war, although it is reported that there is little in the way of direct war orders. **The company has benefited greatly from an increased South American market.** The **activity in the aviation industry** which has received many direct war orders **is reflected indirectly in the Bosch business because of the large number of aeroplane magnetos it manufactures.** The company also is increasing its production of distributors for the Ford automobile company.

Fuse adaptors for 14 and 16-inch artillery shells are **being manufactured by the Gilbert and Barker Manufacturing Company** West Springfield, **according to President S. C. Hope,** and are being **purchased by United States ordnance offices and armament manufacturers in this country.** The fuse adaptor is a shell section which fits into the base of the shell case and surrounds the mechanism for the timing of the explosive. Each one weighs between seven and eight pounds and is made of specially-hardened steel shaped by precision work of skilled mechanics.

A 5 per cent raise in all departments of the Foster Machine Company, Westfield, was effective Dec. 4. Approximately **400 employes benefited** according to company officials. **In July the concern paid a 2½ per cent bonus** to all its workers on the amount of their wages for the first six months of the year.

New machinery is arriving at the Holyoke works of the **Worthington Pump and Machinery Corporation, the first units of a large order for additional equipment** that was placed several months ago. This is part of the long range expansion program planned by the management for the Holyoke plant. The **cost of the new equipment is approximately $100,000,** it is understood. **Election of Maynard D. Church as a vice president of Worthington is announced.** Mr. Church is **also president of Moore Steam Turbine Corp. Wellsville, N.Y.,** which has been for some time a Worthington subsidiary, and he will continue to be in charge of Moore operations. **Harold W. Stoddart of South Hadley has been appointed manager of the turbine well pump division of Worthington in Holyoke.**

A "sizeable" order from the Curtiss-Wright Corporation of Buffalo for fuel gages to be used on Curtiss pursuit planes for the United States, French and Norwegian armies has brought capacity business to the Boston Auto Gage Company of Pittsfield. According to Thomas C. Nelson, company president, **the order is the largest the firm has received in several years** and will require three or four months for completion.

The L. S. Starrett Company of Athol announced a Christmas bonus to its employes, according to the length of service with the concern. The bonus pays from 4 per cent to those who have been with the company for a year or less to 10 per cent for those who have been with the company five years or more. **The company has been doing a brisk business in precision tools.**

Domestic business of the Package Machinery Company, Springfield **has grown substantially during recent weeks, Roe S. Clark, vice president said** and present production is "very well diversified. The **plant** also **has orders from England and other foreign lands.** The company is now employing about 300 on a single shift that is working overtime.

James Y. Scott, executive vice president of the **Van Norman Machine Tool Company,** Springfield, **has accepted the nomination to the resolutions committee of the National Association of Manufacturers** which will formulate "Industry's platform for 1940" for adoption by the Congress of American Industry in New York. **Chairman of the resolutions committee is Charles E. Speaks,** president of **Fisk Rubber Corporation, Chicopee Falls.**

The United States Armory's production on the new Garand semiautomatic rifles in Springfield is carrying a working personnel of 2,300 and officials confidently expect that before many more weeks the capacity working load of 2,500 will be reached. Men have been taken on gradually since the beginning of the year, when the work force numbered 1,500. Some delay in taking on additional help was experienced as the plant awaited the various tooling up processes.

Directors of the Perkins Machine and Gear Company of West Springfield, **have voted the regular quarterly dividend** of $1.75 a share on preferred stock. The dividend will be paid Dec. 11 to stockholders of record, Dec. 4.

A pickup in production has begun at the Westinghouse plant in East Springfield, W. O. Lippman, works manager announced. Employes are being called back to augment the personnel.

Production of forgings for the Navy is adding considerably to the current output of the Moore Drop Forging Company, Springfield, where the volume is reported to be at a high mark. In recent weeks, **Moore also has enjoyed** an **upturn in its usual sales to both the aircraft and automobile industries.**

George Bertram Ambler, 66, vice president of the **Black Diamond Saw and Machine Works** in Natick **died recently.**

General Machine & Tool Co. has **moved to larger quarters** on the second floor of the Osgood Bradley Building and has **added new machine equipment to take care of expanding business.**

The **Chapman Valve Manufacturing Company,** Springfield **has reached the production level on the 1937 peak,** an official said and this **last quarter of the year will be the highest for 1939.** The 1937 peak was the highest the company had enjoyed since the depression began and was just prior to the recession which cut production in 1938. Additions to the present buildings and equipment of the Chapman Valve Manufacturing Company costing several thousands of dollars are being planned for the near future Fred T. Low, treasurer, has disclosed.

Reporting continued substantial increase in Rhode Island employment in October, State Labor Director Harvey Saul said the metal industries hired more workers in October than in any month since 1929. Saul described the gains as "greater than seasonal" and said indications were they **will continue for several months.**

Ralph E. Flanders, president of Jones & Lamson Machine Co. Springfield, Vt., **has been appointed representative of management in the Federal Committee on Apprenticeship,** recently enlarged to provide broader representation to management and labor in formation of apprenticeship policies. **Mr. Flanders first entered the machine business through the apprentice school maintained by Brown & Sharpe Manufacturing Co.,** Providence of which he is a graduate. He **is a past president of the National Association of Machine Tool Builders.**

Hannifin Manufacturing Company of Chicago, has **recently acquired the business of the Rock River Machine Company of Janesville, Wisconsin.** The Rock River Machine line will be continued, but with improvements and refinements as **Hannifin** policy. Engineering, sales and manufacture of the Rock River Machine line will be carried on in the Janesville, Wisconsin plant.

The Rock River Machine line has for more than forty years served steel fabricating plants and departments all over the world. It is reported that the addition of new related products is also contemplated.

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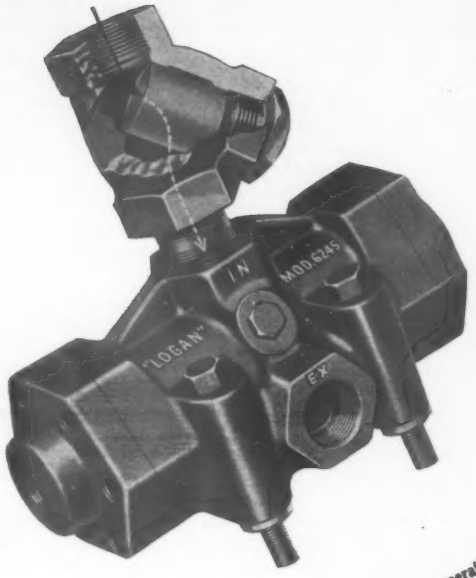
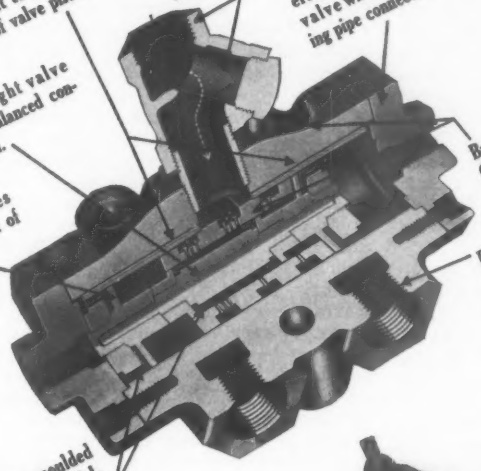


"LOGAN"


Air inlet to operating ends of valve piston.
Built in strainer furnished with valve. Easily removed for cleaning.
Removable end covers permit servicing valve without breaking pipe connections.
Light weight valve piston, Balanced construction.
Bronze liner and body. Corrosion resistant materials throughout.
Large area insures positive movement of valve piston.
Furnished in ¼" to 1¼" pipe sizes inclusive. Operating pressure 30 to 150 lbs.
Composition moulded cup packings, Self Adjusted by air.

The operation of the Improved Model 6245 Balanced Piston 4-Way Master Control Valve is simple and positive. Note the many new and improved features of design and construction in the cut-away view. This Master Control Valve, used in conjunction with Bleeder Valves, has broad flexibility of application in the remote control of air cylinders and devices from conveniently located stations. Control may be by hand, foot, cam, pressure or electric solenoid. Lower view illustrates a remote air operating system in its simplest form. Write for Bulletin 371 giving complete information and diagrams of typical applications.

Typical Remote Control System

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Chapter Doings . . . . By George J. Keller

BY THE time you read this Christmas Joys and New Years Headaches will have passed by.

This job of mine gets under my skin occasionally and then something happens which goes a long ways towards reimbursing me for my humble efforts. The Missus called me today and said, "You received a Christmas card from S. J. Black, Turtle Creek, Pa. Who is he?" Well, I worked under Sam Black 22 years ago while with Westinghouse. Haven't seen or heard from him in 10 years. He saw my picture, thanks to that "ornery" Cy Newton, in the last issue. Bless you, Sam, I'll look you up the next time I am down your way. Joy and sorrow seem to go together. Bill MacRae passed away on December 10th. We will miss him thruout Western New York. He was a swell fellow and I would rather be that than President of the U. S. A. Mighty sorry to hear that Bill Brown had to resign as Vice Chairman of New York-New Jersey Chapter. Bill is a good fellow. He got his early training in Buffalo. Recently flew over Ontario from Detroit to Buffalo and did not realize that I was flying over a country that was at war and our next door neighbor. Not until I read Singer's report of Ontario Chapter Doings did this come home to me.

Here's hoping that with the advent of the New Year, our Society and the Tool Engineer will continue to grow as in the past.

Detroit Chapter members, 176 strong, spent a gala evening at Club Saks December 14th. The meeting was a "just for fun" party. Bill Knowles won the Big door prize. Twelve proud, plump, and strutting gobblers, given as door prizes graced the Yuletide tables of Watson, Licktige, Ripley, Peasance, Ketelsen, Greenshield, Herman, Holland, Diamond, Hauge, DeBuigne and Duffy. At the mike, Charlie Thiede, hoarsely whispered to Clyde Hause who relayed his Merry Christmas message. It was a cold and Charlie can prove it. Otto Franke, who toured Old Mexico last summer brought his colored movies of the trip so that all might share his fun. Otto's pictures included just about everything: scenes of beauty, scenes of historic interest and an honest to gosh Mexican Bull fight. Chrysler Crop. presented sound movies highlighting the cream of Major Edward Bowes' Amateur crop. The evening's festivities concluded with a a floor show.

About one hundred and fifty members, wives, daughters and sweethearts attended **St. Louis** Chapter's Christmas Party, December 14th from 6:30 P. M. to 1:30 A. M. Turkey dinner, lecture, music, dancing, ample liquid refreshments, presents for the ladies and a floor show. The fine singing of Chairman Doogan's pretty daughter and the jitterbug dancing by Reheis highlighted the evening's entertainment. The technical session by Mr. Shartle of the Vickers Co. and Mr. Hereen of the Hannifin Mfg. Co. was short. The ladies listened respectfully and thought their men were all wonderful because they understood and enjoyed it. Ladies' nights are aces.

On Friday evening, December 15th, **Elmira** Chapter held a joint meeting with the Foreman's Club of Remington-Rand, Elmira Plant. About 150 members and guests heard Burnham Finney, Editor-in-Chief of the American Machinist on "The War—How it affects your job." The present and future effect of aircraft, arms, and munitions purchases by foreign nations and the expansion and modernization of our arsenals and navy yards was pointed out by him. The meeting was in the cafeteria of the Remington-Rand Plant and a tour of the plant was made after the meeting. Binghamton and vicinity sent a large delegation. The Remington Rand band and a "very much mixed" quartet led by Joe Ahearn enlivened the occasion.

Milwaukee Chapter turned out in goodly numbers at the December 14th meeting and enjoyed an interesting talk on "Trends in Machine Tool Design and Use" accompanied by slides, and given by Mr. John Haydock, managing editor of American Machinist. Mr. A. P. Jones, a guest was the winner of the door prize. We hope Lucky Jones knows how to use his prize. Mr. W. P. Schmitter, Chief Engineer of Falk Corp. our speaker at the November meeting was again present at this meeting and "rumor" says he is going to make application for membership. We will all be glad to have Mr. Schmitter associated with us. There is a **Special Surprise** for members and guests who attend the January 11th meeting. Come out, Boys. A nominating committee will be elected at this meeting.

Twin City Chapter's December meeting was well attended and the talk by Mr. John Haydock, managing editor of the American Machinist was highly appreciated by everyone present. Chairman Wise succeeded in breaking a long standing precedent of no standing upon the part of Mr. Pennington, Chairman of the Meetings Committee, when he got to his feet to say a few words. It was pleasant to have Vice Chairman Gruber back again after a long absence.

Ontario Chapter held their Dec. 8th meeting in Toronto at the Oak Room of the Union Station. Mr. F. T. Ellis of the Heald Machine Co. gave an interesting talk on Precision Finishing of Surfaces, illustrated with slides. On a motion from the last meeting, a resolution was sent to the Minister of National Defense at Ottowa, telling him that the full technical knowledge of the Ontario Chapter was at the service of any industry engaged in War work, to whom their problems could be brought, and a reply was received and read from the Minister of the Department of National Defense, thanking the Chapter for their spirit of loyalty and cooperation. The next meeting will be in Hamilton January 12th and Mr. Gray, one of the members of the Ontario Chapter is going to give a talk on "Fixture Work applied to Aeroplane Construction."

Mr. John Haydock of the American Machinist magazine gave an interesting talk on "Machine Tool Design and Use" before 100 members and guests at the **Tri-City** Chapter meeting, Dec. 6th. Particular attention was paid to the slides showing new machines because many were of installations in local plants. Ed Dickett couldn't be there but Ford Lamb was present in his place and told about the new chapters formed during the past year. The Blackhawk Hotel on the Davenport side of the river, was the meeting place for a change.

Well, fellows, if **Hartford** ever slows down to just a run again, Geo. Leitch will buy a round. On December 4th, about 250 heard Ralph L. Lee, Director of Public Relations for General Motors, give an interesting talk on Tooling for New Models. The hecklers didn't have a chance this time as his talk was non-technical. At the dinner meeting Ralph H. Walker, Warden of Connecticut State Prison, gave the coffee talk on The Straightening Process in the lives of men.

Toledo Chapter's December 5th affair, at Pages Dairy was a huge success. The trip through the plant was grand and the picture depicting the entire process and development of diamonds was enjoyed by all. The attendance was over 150. This can be attributed to the dear, dear ladies, and needless to say the way they enjoyed themselves has stimulated plans for similar happenings. The large silver platter donated by Mr. Krandall, diamond expert, was won by Jeannette Maier, daughter of ASTEer Harry Maier. Bob Haynes had some of the boys over to his house and treated them to "egg nogs." He is tops with the boys and we're hoping that he will find time to attend the meetings hereafter.

The December meeting of **Baltimore** Chapter was attended by 125 members and friends. Mr. Fred Hammer, Warner and Swasey Co. enlightened us on the Development of Small Tools for Turret Lathes, with an illustrated lecture. They were especially glad to see new faces from local concerns at the meetings. Baltimore Tool Engineers are finding it well worth their time to attend these educational sessions where they can have lots of shop problems ironed out by men with experience. Baltimore's Third Annual Dance was a grand and

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glorious affair, well attended and much enjoyed.

The war in Europe has caused one casualty among the **New York-New Jersey** group it was learned at the December meeting when Herb Hall read a letter from Bill Brown tendering his resignation as Vice Chairman of the Chapter. Bill is so busy lining up productive machinery to increase the output of aircraft engines at Wrights, that he has had no time for chapter affairs. His resignation was accepted with regrets. A review of the fundamental principles of motion study as applied to jig and fixture design was given in a talk by Raymond V. Havicon, tool room supervisor of the Scovil Mfg. Co. of Waterbury, Conn. a contract shop that makes everything from vanity cases to bullets. He quickly indicated his knowledge of the Tool Engineer's position in the manufacturing set-up by tracing the course of the job from the time the contract is accepted and the tool designer goes to work to the point where the tools are actually used on the job. With the engineering department, the tool room and the production shop all after him, the Tool Engineer is behind the eight ball most of the time.

Burnham Finney of the American Machinist addressed **Syracuse** Chapter's dinner meeting at the Syracuse Industrial Club on December 12th. It goes without saying that the seventy members were deeply interested in his subject, "The War—How it Affects Your Job." After all the job is the most important thing in every Tool Engineer's life. Two prominent members of the Syracuse Chapter were claimed by death early in December—Lloyd W. Moulton of Manufacturers Consulting Engineers, and William L. MacRae of Dalrae Tool Company. Seven new members were admitted since the last meeting and this is only the beginning. Next month will show a larger gain. The entertainment committee is busy with plans for a dance the latter part of January.

The four lady registrars, the twenty-two fine exhibits, the chicken dinner and the singing led by Ernie Ekstrom charged the atmosphere with that certain sense of congeniality and ease which made **Rockford's** December 7th meeting doubly enjoyable. Ford Lamb gave a talk that won hearty applause. A short recess and then the excellent sound movie description of a plant visitation thru the factory of the United States Electrical Motor Co. was shown. Projectors were switched and the technical lecture by John Haydock, managing editor of the American Machinist, held the audience of 350 men in rapt attention for an hour and twenty minutes. The business meeting attended by 75 members on Nov. 28th was embellished by entertainment, community singing, smorgasbord, smokes and card games. Free speech reigned supreme and many points of doubt and wonder on the part of the Program and Entertainment Committees were cleaned up. This meeting was the forerunner of many more like it and should go far towards building a solid foundation of true democratic feeling under the Chapter. Such threshing out of problems builds for permanency.

The December 11th dinner meeting of **Racine** Chapter was held in the main dining room of Hotel Racine with 75 members and guests attending. The Mohr-Jones Hardware Company, The Independent Pneumatic Tool Co. and the Vanadium Alloys Steel Co. had displays of their products. Mr. John Haydock, managing editor of the American Machinist, spoke on "Trends in Machine Tool Design." His talk was illustrated with lantern slides showing many of the latest machines that were to be shown at the Machine Tool Show in Cleveland. An interesting discussion followed the talk.

Philadelphia played host to President Jim Weaver Wednesday evening, Dec. 13th at the Engineer's Club. Jim told of some of the plans for the national meeting and urged all to attend. William H. Oldacre, D. A. Stuart Oil Co. gave an interesting discourse on the place of cutting oils in various machining operations. The consensus of opinion of the shop men and engineers present was that he put across a message that was easily understood and everyone felt that he had learned something.

Dayton Chapter No. 18 were guests of the Inland Mfg. Co., Dayton on November 11th. Grand entertainment was furnished by the company in the form of a musical band and a wandering magician. The greatest piece of magic was produced by Ed Seifreat, who, with a wave of his hand, removed the vest from Toastmaster "Whitey" Poock, without removing Whitey's coat. Mr. Dale Phillippi, Research chemist for the Inland Mfg. Co. produced magical formulas with a piece of chalk that amazed the 150 members and guests present. Mr. Phillippi's topic "Molding Plastic" traced the history of plastics from its origin to the many varieties and forms on hand at the present time. The dinner speaker was Mr. Bob Husted, Sports Editor of the Dayton Herald, who kept everyone present interested in his recital of inside facts on Baseball and Boxing. A plant tour climaxed the meeting.

Schenectady's December meeting was a big success. 195 members and friends gathered in Danish Hall to hear Mr. Burnham Finney, editor of American Machinist. A good representation was present from American Locomotive Company and the V&O Press Co. Also present were members of General Electric Foreman's Association. Also present was Mr. J. C. Molinar, New York district manager for Pratt & Whitney. The entertainment committee, with Harry Crump as chairman, presented a fine program in which Miss Jane Rutz played the accordian and led the community singing. Parker Sherwood Jr. gave several fine selections on the marimba. C. H. Borneman then introduced four salesman, George Lauterborn, Carl Sertl, Edward Girardot and Leroy Urban who practiced their public speaking course on the audience by introducing and selling "Whatsits."

The American Society of Tool Engineers Covers Your Field

Every reader of this publication, if not a member of this Society, owes it to himself to investigate the advantages of affiliation with the A.S.T.E. Technical activities of this worthwhile organization bring you constantly up-to-date on what's happening in your world, what's new, new methods, new processes of fabrication, engineering procedure and standardization.

The industrial relations activities, keeps members in touch with new openings for employment and changes in personnel. A great many responsible manufacturing executive positions have been filled through this activity.

Not a small part of the value of membership is that resulting from the various social activities. Numerous events, wherein individual members mingle with their fellow coworkers and friends in the same profession, occupy a prominent place. Many "extra-curricular" activities, such as speakers' clubs, provide a splendid outlet for the expression of each member's views and ideas and augment a well balanced, complete program, specially "engineered" for the progressive mechanical executive.

Don't put off any longer what you have been wanting to do. Write to THE TOOL ENGINEER, 2842 W. Grand Boulevard, Detroit, Michigan or to the American Society of Tool Engineers, 2567 W. Grand Boulevard, Detroit, Michigan for your application blank now. Then fill it out and return it promptly—be a definite factor in promoting the profession of which you are a part.

"EVERY MAN OWES IT TO HIMSELF TO DEVOTE A PORTION OF HIS TIME TO THE OCCUPATION OF WHICH HE IS A PART."—THEODORE ROOSEVELT.

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A two and one-half year program of scientific study, which will culminate in payment of $200,000 in awards, and which should produce widespread social and industrial benefits, was announced here today by The James F. Lincoln Arc Welding Foundation.

The 458 awards are established for studies bringing out benefits of a social, economic or commercial nature, such as reduction or elimination or hazards to safety and health, greater availability of comforts and conveniences through reduced prices, greater utility and durability of machines and structures as well as industrial benefits such as cost savings and other advantages in manufacture, frabrication or construction.

Studies encouraged with a view to creating such large-scale benefits will concern machines, products and structures of all types including: automobiles, trucks, buses, airplanes, locomotives, freight and passenger cars, street cars, ships and boats of all types, buildings, bridges, houses, furniture, heating and air conditioning equipment, electric refrigerators, farming machinery, road-building equipment, as well as industrial machines and products of every conceivable kind.

Awards

Awards, ranging from $13,700 to $100, and embracing the 12 classifications and 46 divisions into which the industrial field has been divided for purposes of participation (see accompanying table of Classifications and Divisions), consist of the following:

1st Grand Award—$13,700

The 1st Grand Award, which will be paid for the best progress report submitted, will total $13,700.

3 Main Program Awards: 1st, 2nd and 3rd awards of $10,000, $7,500 and $5,000.

48 Classificational Awards: 1st, 2nd, 3rd and 4th awards of $3,000, $2,000, $1,000 and $800, respectively, in each of 12 classifications.

184 Divisional Awards: 1st, 2nd, 3rd and 4th awards of $700, $500, $250 and $150, respectively in each of 46 divisions.

223 Honorable Mention Awards: 223 awards of $100 each for papers which do not share in any other award but which deserve honorable mention.

Wide Range of Subjects

Innumerable subjects are suitable for study. The 12 Classifications and 46 Divisions of participation cover every conceivable machine, building, structure or product made of ferrous or non-ferrous metal.

CLASSIFICATIONS AND DIVISIONS OF PARTICIPATION

Classifications — Divisions

A Automotive—A-1 Engines or Engine Accessories; A-2 Bodies or Body Accessories; A-3 Frames or Frame Accessories; A-4 Trailers.

B Aircraft—B-1 Engines or Engine Accessories: B-2 Fuselages or Fuselage Accessories.

C Railroad—C-1 Locomotives; C-2 Freight Cars; C-3 Passenger Cars; C-4 Locomotive and Car Parts.

D Watercraft—D-1 Commercial; D-2 Pleasure.

E Structural—E-1 Buildings and Similar Structures; E-2 Bridges; E-3 Houses; E-4 Miscellaneous.

F Furniture and Fixtures—F-1 House; F-2 Office.

G Commercial Welding—G-1 Commercial Welders or Job Shops; G-2 Garages or Service Stations.

H Containers—H-1 Contents Stationary (Tanks, etc.); H-2 Contents Moving (Pipe Lines, etc.).

I Welderies—I-1 Commercial Welderies; I-2 Plant Welderies.

J Functional Machinery—J-1 Metal Cutting; J-2 Metal Forming; J-3 Electrical; J-4 Prime Movers; J-5 Conveying; J-6 Pumps and Compressors; J-7 Business; J-8 Functional Machinery not otherwise classified; J-9 Jigs and Fixtures; J-10 Parts of Functional Machinery.

K Industry Machinery—K-1 Processing; K-2 Construction; K-3 Petroleum; K-4 Steel Making; K-5 Farming; K-6 Household; K-7 Food Making; K-8 Textile and Clothing; K-9 Printing; K-10 Industry Machinery not otherwise classified.

L Maintenance—L-1 Machinery and Mechanical Equipment, including truck, bus and taxi fleets; L-2 Structures and other applications for arc welding in Maintenance such as pipe lines, railroad tracks, bridge strengthening, etc., not covered under L-1.

Unlimited Opportunities for Participation

Participation in the Progress Program is open to everyone who plays any part in actually bringing about progress in the executive, design, fabrication, manufacture, construction or maintenance phase of industrial product or structure development. Authors of studies may be executives, engineers, designers, architects, draftsmen, plant superintendents, production managers, foremen, proprietors of automotive garages or service stations, owners and operators of fabricating and repair shops, or any other person engaged in the various phases previously mentioned. One author, or a group of authors, may submit a study. Any company or concern may submit more than one study, provided each is on a different subject and is prepared and submitted by a different author or group of authors.

Studies to Cite all Benefits of Progress

Studies may bring out any and all social, scientific, economic and commercial benefits which attest progress in industrial development. Studies must, however, report progress which can be attributed to application of the electric arc process of welding within the two and one-half year period, January 1, 1940 to June 1, 1942. Such progress may involve one of the following: (a) Redesign and manufacture or construction of an existing machine, structure, building, manufactured or fabricated product of ferrous or non-ferrous metals; (b) New design and manufacture or construction of a machine, building, etc. as in (a); (c) Organization, development and con-

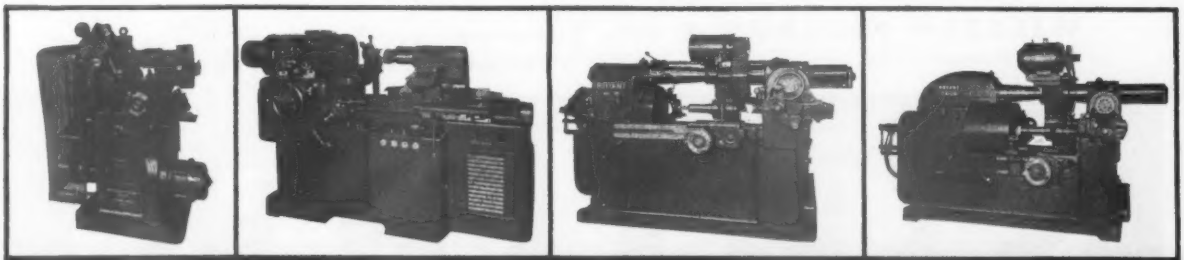
(Continued on page 46)

BRYANT GRINDERS

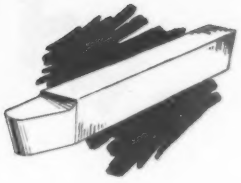
FOR EVERY INTERNAL AND FACE GRINDING NEED

THERE is a Bryant Grinder to meet every requirement of tool room work, small lot grinding, and high production work. The exclusive feature of BRYANT wheel head suspension is an outstanding asset when grinding straight, taper, a combination of straight and taper, or double taper holes in one operation, as well as curved, cam shaped, or blind holes. BRYANT Two-Spindle Grinders are a further asset in that the bore and face of the work may be ground concentric in one setting. BRYANT Grinders cover the complete range of internal and face grinding work — from tiny bearing races to large gears and cylinders. Send for catalogs.

Series 5 **Series 112** **Series 16** **Series 24**



BRYANT CHUCKING GRINDER CO., Springfield, Vt.

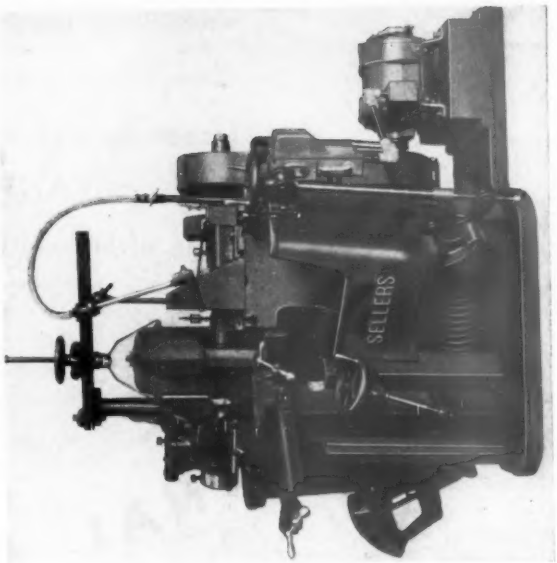


How your tool room attendant can step up production

IN THESE DAYS every productive employee counts — but only while on productive work. Do you know how much of your machinists' time is spent on tool grinding? The figures may surprise you.

Why continue? An expensive machine stands idle . . . production is held up! Yet your tool room attendant can do this job. With a Sellers Tool Grinder, he can grind tools more accurately than the best machinist can by hand . . . and in less time. Less tool steel will be wasted and the tools will last longer and cut better. Your machinist can be kept on the work you are paying him to do — and production will not lag.

If you are looking for a way to save money and keep production at peak, we know you will want more information about Sellers Tool Grinders. Write today.

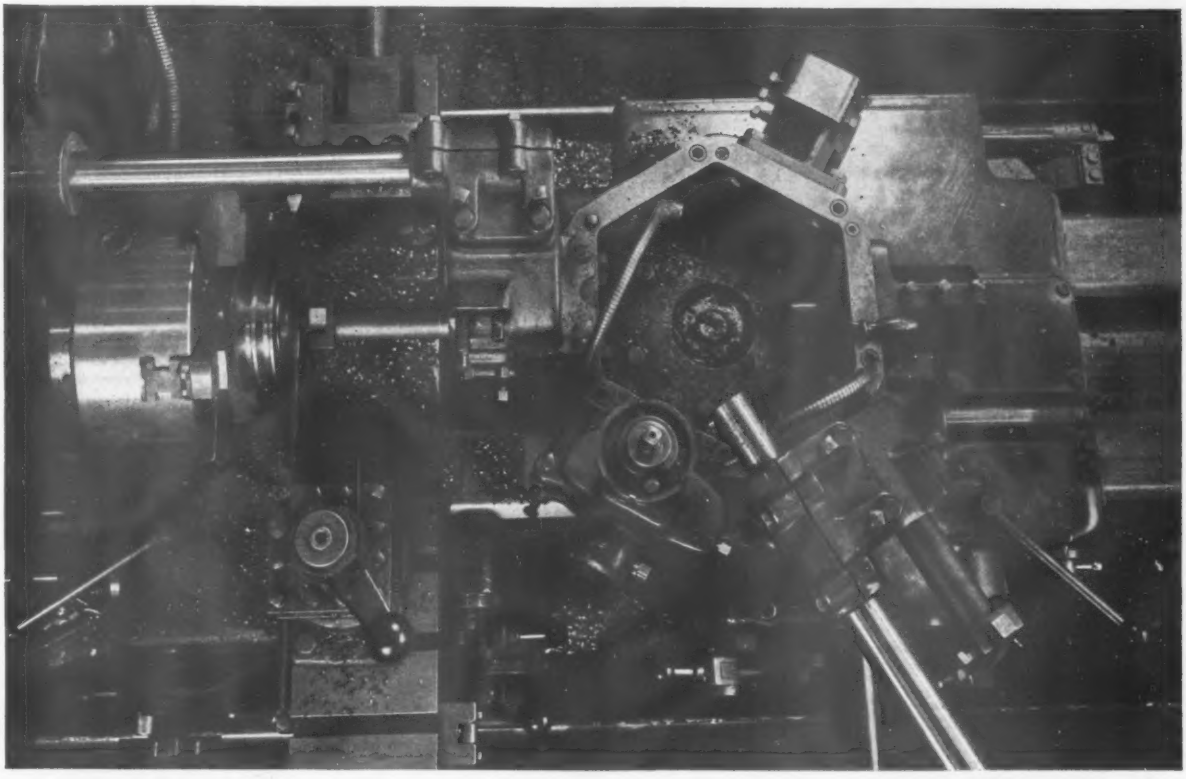


WILLIAM SELLERS & CO. Incorporated
1626 Hamilton St. - - - Philadelphia, Pa.

FOUNDED SELLERS 1848

Sellers

An obsolete machine *may* show as an asset on your books, but is it *still* an asset in your shop?



PRODUCTION was more than doubled when a Jones & Lamson Universal Saddle Type Turret Lathe replaced an older machine on small lots of cast iron V-belt pulleys.

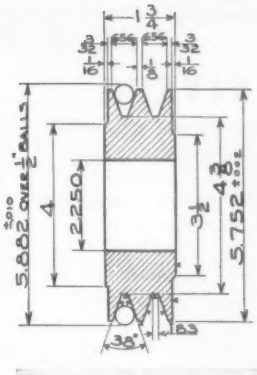
The great rigidity and advanced design of the Jones & Lamson Universal machine allow carbide tipped tools to be used to their maximum advantage in this simple set-up. If larger lots of these pulleys were required, special tooling could be designed to the full capacity of the machine and still further increase the production.

An obsolete machine may be an asset in your balance sheet but is a liability in your shop.

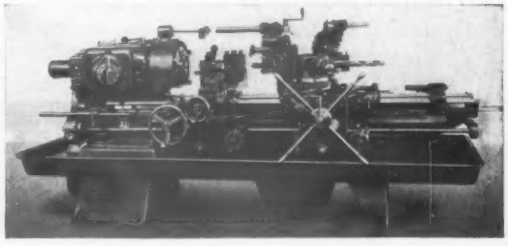
Let us demonstrate how a Jones & Lamson Universal Turret Lathe can increase *your* production and *your* profits.

JONES & LAMSON MACHINE CO.
Springfield, Vermont, U. S. A.

Manufacturers of Saddle and Ram Type Universal Turret Lathes, Fay Automatic Lathes, Double-End Milling and Centering Machines, Automatic Thread Grinding Machines, Comparators, Tangent and Radial, Stationary and Revolving Dies and Die Chasers.



New, modern equipment doubled production on this part



Rapid Proof for Arithmetical Problems Involving Multiplication, Division and the Extraction of Square, Cube and Other Roots

By ROBERT T. BARNETT
MEMBER A.S.T.E.
GLEASON WORKS, ROCHESTER, N.Y.

Rapid Proof for Arithmetical Problems involving Multiplication, Division and the Extraction of Square, Cube and other Roots.

Very often, the machine or tool designer or anyone employed in the engineering profession, finds it necessary to solve mathematical problems such as finding the length of the hypotenuse on a right angled triangle, having given the length of each of the other sides or legs. He may choose to obtain the length of the hypotenuse by use of the formula whereby the square root of the sum of the squares of the lengths of the other sides gives the answer sought. After obtaining the squares of the other two sides, he may check his multiplications by the following rapid proof. An explanation of this rapid proof may be found in some of the engineering and machinery handbooks, but as it may not be handy to the reader or as he may not be familiar with it, we give it here for multiplication with the addition of information as to what happens when by division, the problem does not come out evenly and there is a remainder to be taken into consideration in order to prove the problem. This last point is not covered by any of the handbooks and is therefore given here as it is important to have it clearly understood in order to take full advantage of these rapid proofs.

Rapid Proof of Multiplication

Take two numbers such as 4576 and 289 and multiply them together.

Multiplicand	Multiplier	Product
4576 times	289 equals	1322464

To check this multiplication, add the digits in the multiplicand as follows: 4 plus 5 plus 7 plus 6 equals 22. Continue by adding digits in 22. 2 plus 2 equals 4. This brings us down to a single or final digit of 4. We will hereafter call this last single digit the final digit as these single digits are the result of continuing to add the digits in a multiple number until we obtain the single or final digit.

Now, obtain the final digit in the multiplier in the same manner, which will give 2 plus 8 plus 9 equals 19. 1 plus 9 equals 10. 1 plus 0 equals 1 and this is the final digit for the Multiplier. Next, obtain the final digit for the Product or 1 plus 3 plus 2 plus 2 plus 4 plus 6 plus 4 equals 22. 2 plus 2 equals 4 or the final digit for the Product.

Now, multiply the final digits from the Multiplicand and Multiplier together or 4 times 1 equals 4. This 4 equals the final digit from the Product and the solution of the problem is correct. If you do not obtain a similar result, recheck your work as it is probable that an error has crept in somewhere.

Rapid Proof of Division

Take two numbers such as 1322464 and 289 and divide the first by the last.

Dividend	Divisor	Quotient
1322464 divided by	289 equals	4576

Find the final digits as in the multiplication problem above for each of the numbers for the Dividend, Divisor and Quotient which will be respectively 4, 1 and 4. Multiply the final digits from the Divisor and Quotient together or 4 times 1 equals 4. This 4 equals the final digit of 4 from the Quotient and the solution of the problem is correct.

Now, we will take a problem in division which will involve an answer which has a remainder and will show how to prove the solution.

Take two numbers such as 1322476 and 289 and divide the first by the last.

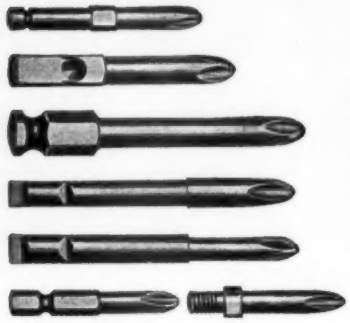
Dividend	Divisor	Quotient
1322476 divided by	289 equals	4576
	plus a remainder of	12

Next, find the final digits as before for the Dividend, Divisor, Quotient and also the Remainder and these will be respectively, 7, 1, 4 and 3. Multiply the final digit for the Divisor of 1 by the

(Continued on page 46)

APEX
POWER BITS for Phillips and Slotted Screws ⊕ HAND DRIVERS General Purpose and Super Service for Phillips Screws ⊖

POWER BITS FOR PHILLIPS SCREWS



Apex-Phillips Power Bits cover the entire range of Phillips screws, and in design to fit all makes of electric, air and spiral drivers. Made from special shock-resisting steel, heat-treated and tempered to give the maximum in hardness, toughness and wear resistance.
Apex Power Bits for Slotted Screws are made to fill all makes of electric, air and spiral drivers and range in size from No. 4 to No. 16 screws.
RECONDITIONING SERVICE
Apex-Phillips Bits, when returned to us, can be reconditioned time after time at a substantial saving. Each reconditioning shortens the bit approximately 1/8".
PROMPT DELIVERY
on standard Bits and Hand Drivers.

HAND DRIVERS

Apex-Phillips Hand Drivers are General Purpose and Super Service types. The Super drivers are especially recommended for case-hardened, self-tapping screws. "Stubby" Hand Drivers are also made in both types.
Shock-proof handles of "Superloid" are available with either General Purpose or Super Service blades.
Hand Brace Bits, Service Drive Bits and Offset or "L" Drivers can be had for all sizes of Phillips screws.
Phillips License No. 2
Patent Nos. 2046837-38-40

The APEX MACHINE & TOOL Co.
Dayton, Ohio

World Standard for Accuracy

BARBER B-C COLMAN

GROUND HOBS

Just as Johansson blocks are the world standard for accuracy in toolrooms, Barber-Colman Ground Hobs are a world standard for accuracy in hobbing. Extremely precise; unexcelled in cutting capacity, fine finish and long-run economy . . . B-C Ground Hobs can be duplicated at any time to reproduce work exactly. Designed by expert hobbing engineers; made exclusively by skilled workmen employing specially developed methods and machines; held to rigid requirements of material, heat-treatment, form and finish; Barber-Colman Hobs represent the utmost in hob value. Buy B-C Ground Hobs for precise work, extra fine finish and high production . . . Buy B-C Unground Hobs for work having ordinary commercial limits. Consult our engineers for competent hobbing advice.

BARBER B-C COLMAN

PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

New No. 22-L
Table size: 45" x 10".
Feed range: 26" x 11" x 17".
Ram movement: 19".

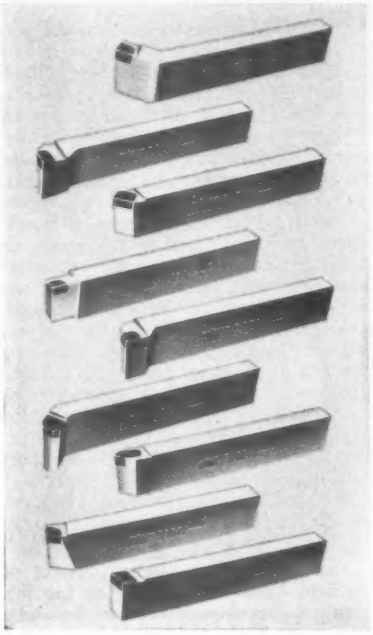
RESET the cutterhead instead of the work. Mill vertically, horizontally or at any angle with a minimum of set-ups or side trips to other machines. Eliminate the errors involved in extra set-ups, increase output and cut your costs. The flexibility, ease of adjustment and ability of Van Norman Ram Type Universal Millers to handle a wide range of work will help you to get more and better work through your toolroom, pattern shop or experimental departments. Five models meet all needs from the heaviest type of work to the most sensitive. Write for Bulletins to the

Van Norman Machine Tool Company
Springfield, Massachusetts

Van Norman Milling Machines

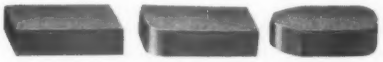
Carboloy Stocks Standard Tools and Blanks for Immediate Delivery

Carboloy Standard tools (Catalog M-37) consist of nine styles (illustrated below), suitable for a wide range of general purpose turning, facing and boring operations. Each style is available in all commonly used sizes and so designed that each is adaptable to a large variety of work. This feature is of particular value to shops having small runs, job-lot work, as tool cost can be absorbed over a number of jobs.



15% Discount On Carboloy Standard Blanks

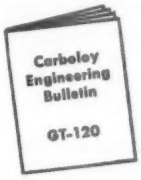
Standard blanks (Catalog M-37) are available in 152 sizes, 3 styles as shown below. Priced 15% less than special blanks, these can be used on more than 90% of all Carboloy cutting tool applications. When slight adjustments in tool design are necessary to employ standard blanks they usually can be made without affecting purpose of the tool.



R-100 R-200 R-300

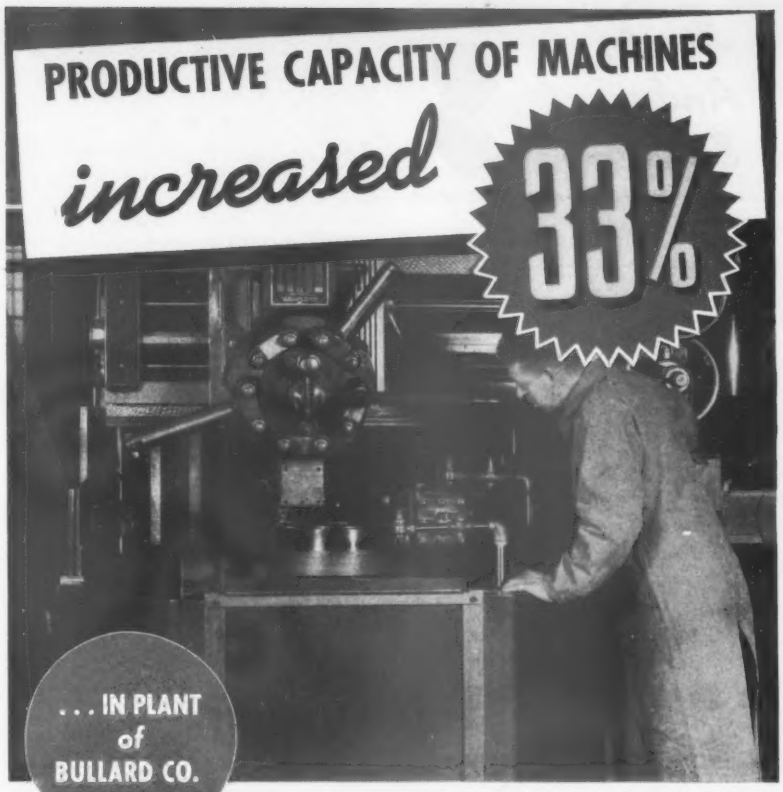
Steel Cutting Recommendations Contained In New Carboloy Engineering Bulletin

A new engineering bulletin recently issued contains basic data on requirements for cutting steel with Carboloy tools. Gives tool design, set-up, coolants, chip breaking and machine requirements. Particularly valuable is a table giving specific recommendations for speeds, feeds, Carboloy grades, tool rakes and angles, etc. Ask for Carboloy Bulletin No. GT-120.



Carboloy Masonry Drills

Your maintenance man would like to know about the Carboloy Masonry Drill. Drills concrete, brick, tile, etc., 75% faster than old methods. Ask for leaflet GT-103.



Simple Plan Adopted Permits Broad Use of Carboloy Throughout Shop

At the Bullard plant, Bridgeport, Connecticut, quantities to be machined are limited principally to small lots—6 to 200 pieces—usually steel, cast iron or bronze. Bullard . . . familiar with the unusual savings of Carboloy tools on quantity-production jobs tooled up for purchasers of their machines . . . sought some way to obtain comparable savings on their own limited quantity, diversified machining work. Problem was to maintain a reasonably low inventory of carbide grades and tools but at the same time adequate to cover a wide variety of jobs.

To accomplish this, Bullard selected two general purpose Carboloy grades—one for steel—one for all other metals and non-metallics. They then analyzed tool styles used, were able to design six styles of tools in four sizes to cover the majority of their applications.

With these basic problems solved, Bullard delegated one man to actively promote and follow up carbide tool use. Tooling then started on a broad scale.

Results to date: Machines tooled with Carboloy have shown an *average* increase of 33% in productive capacity. The complete story—including a record of savings on 22 steel jobs—will be mailed upon request.

CARBOLOY COMPANY, INC., 11145 E. 8 Mile Blvd., DETROIT, MICH.

CHICAGO • CLEVELAND • NEWARK
PITTSBURGH • PHILADELPHIA
WORCESTER, MASS.

The Mark of CARBOLOY
REG. U.S. PAT. OFF.

Canadian Distributor:
Canadian General Electric Co., Ltd.,
Toronto, Canada

CARBOLOY

REG. U.S. PAT. OFF.

TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS
★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

Handy Andy Says —

For the first time this season, found time to attend a Detroit Chapter meeting and thoroughly enjoyed it—especially the pretzel bending hour. Then, old friends insult each other with impunity. Saw ex-prex Walter Wagner, looking right well after his sojourn in gay Paree, and others too numerous to mention, the most for the nonce carefree and naturally happy. Ed Dickett, popular A.S.T.E. vice prex, was there, and we reminisced a bit as, touring Mexico (via movie), the panorama suggested scenes and persons. We saw a bullfight (in which the critters are converted into beef via the comic opera route—or to the tune of the Toreador) and the ruins of W.P.A. projects of a previous civilization.

▼ ▼ ▼

Among other Americans by choice, our membership includes a minority of Finns, and a few of these were at the meeting. Under a veneer of gaiety —burnished a bit with pretzel oil—one could sense a grim but quiet purpose, as befits scions of a stock that now challenges the major threat of civilization, communism. Now, I am not a Red baiter, or a flag waver (in the sense implied) and have held that communism cannot take root in advanced societies. Hence, I have declared it a minor threat to our American institutions, have further stated that communism, in Russia, is but a stage in a course of evolution from autocracy to democracy. The unwarranted onslaught against Finland in nowise changes the picture. The Russian people do not want war (at least, not the kind the Finns are giving them) but, caught in the ruthless grip of a dictator and the minority in power, must do the master's bidding. It is a strong case for the preservation of our American system of government by the people for the people.

▼ ▼ ▼

As Americans, we can be proud of our Finnish element, which has asked nothing more than the right to work for its bread, thereby setting an example for extraneous as well as native malcontents. They, wanting something for nothing, must take that their own way. The Finns in turn can be proud of their native integrity, their innate honesty, moral and physical courage. We need citizens of their type. Finland, paying her debts, has cast bread upon the waters that, in an hour of need, comes back in tangible substance as America gives moral and material help. And now, speaking for all of us, we can be proud of our common Americanism, that as a people, we can respond generously when suffering makes a demand on our purse strings. I believe that our Finnish members would like me to say these things for them, and to express, in their behalf, grateful appreciation for the support that America is giving their fatherland in this hour. Neutral we may be, politically, but our cheers go for Finland.

▼ ▼ ▼

One of the boys—Dave Carlson of Standard Tool—dropped in on me the morning after the meeting, (Midland's Mike Shea doing the introducing). Dave said he'd gotten a kick out of my tale of Puss in the bath tub and, one word leading to another, we found that we had mutual acquaintances in the East. Dave's father, it seems, knew "Old Man" Rundbom (erstwhile scraper boss at Brown & Sharpe's) and now with Morse Twist Drill, New Bedford. Despite advancing years and lack of practice due to executive work, Mr. Carlson, Sr., can still spot a crescent on a machine way with the best of 'em. All of which led to "Cap" Leonard, with whom I played football on the B. & S. eleven back in '08 and who went with Morse immediately upon completing his apprenticeship. I'd like to hear from him—preferably as an organizer of a Whaler Chapter. You see, gentlemen, these reminiscences that I entertain (?) you with aren't just idle gab. Like the ball in the roulette wheel, I toss a name into the bowl and it lands—perhaps in New Bedford, Mass.

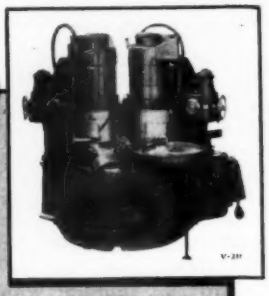
▼ ▼ ▼

Each year, at this time, there come invitations to various Christmas parties, and this year Dave Forsman invited me over to Michigan Tool Company which, I understand, put on quite a spread. But it so happened that I had a date with Doc that afternoon, a/c trying to do something definite about these

(Continued on page 40)

BLANCHARD
Surface Grinders
for 1940

NO. 11

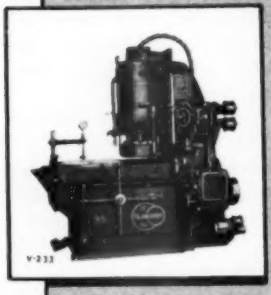


NO. 16-A2

THE Surface Grinders which Blanchard offers for 1940 are accurate, profitable machines which no modern shop should overlook. They grind rapidly the flat work usually done on a surface grinder, and with the proper selection of wheels an *exceptionally fine finish* is produced. The Blanchard will also rough and finish flat surfaces on castings and forgings in one operation.

It pays to use genuine Blanchard wheels, to enable your Blanchard Grinders to operate to best advantage.

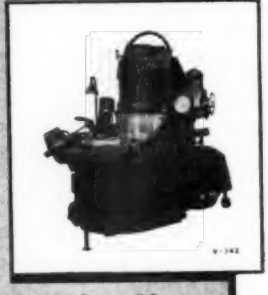
We will gladly send you further information on Blanchard Grinders and Wheels without obligation.



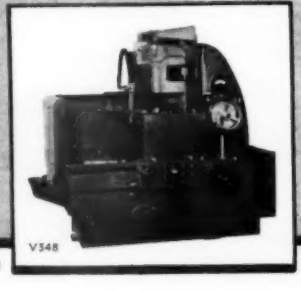
NO. 16

BLANCHARD

NO. 16-A



Blanchard Machine Company, Cambridge, Mass.



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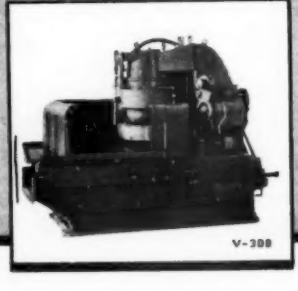


NO. 27

LENGTHENING THE LIFE OF EXPENDIBLE PARTS

The replacement of expendible parts has a persistent way of blocking the path to mine operating economy. By the same token, it offers a great opportunity for cost reductions.

For example: a mine was having plenty of trouble with conveyor screws for handling cinnabar. Requisitions for replacements were coming along all too frequently.

Chromium-Molybdenum cast steel screws solved that problem. A simple preliminary heat treatment gives the screws strength and toughness to withstand heavy pressure and impact loads. Flame hardening the flights to 630 BHN gives them the ability to stand up for long periods under the severely abrasive action of the ore.

The records show that the Chrome-Moly screws last three times as long as others previously used which were actually higher in cost.

Rechecking your own parts specifications may disclose opportunities for similar savings. Our technical book, "Molybdenum in Steel", is sent free on request to interested production executives and engineers.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Molybdenum Company
500 Fifth Avenue, New York City

MOLY

HANDY ANDY SAYS

(Continued from page 38)

headaches that have been making a d—d old sourpuss out of me all these years. By the time Doc got through reaming out my sinuses it was late afternoon and my nose was a gushing fountain, so I hied for home and a supply of Kleenex. (Another year, eh, Dave?)

You know, Otto Lundell of Michigan Tool is quite a genius in his own right, being an outstanding engineer with an added flair for inspiring his boys to do the unusual. They have worked out some very advanced methods in gear processing, among other things, as well as in the broaching field. In addition to a fine, modern plant on McNichols Road, Detroit, there are various affiliates including a plant in Canada, thus making it an international concern. Which reminds me that, a few years back, I called on Otto Lundell with a view toward including him in an article a publisher had asked me to write. But about that time they had made me chairman of the A.S.T.E. Editorial Committee and piled so much work on me that, by the time I got the article finished, the editor had died or something and his successor—an ex-preacher, I believe—wasn't interested in engineering or engineers. Well, I haven't forgotten; merely bided my time. Michigan Tool is now mentioned among our advertisers. Who is next, "nobody knows"—not even myself.

▼ ▼ ▼

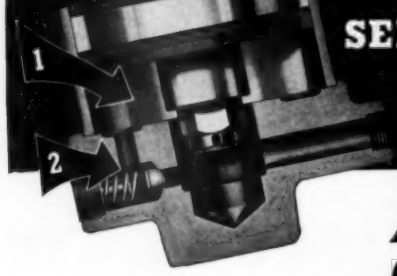
Was out to see O. B. Jones 'tother Sunday, partly out of curiosity to see the home on the hillside that is built to endure forever, but mostly because O.B. had had the misfortune to puncture a foot with an expanding bullet. No, it wasn't amateurish carelessness—O.B. knows his guns—but one of those things. Anyway, he is coming along at latest reports and should be out of the trenches around New Years. Send him a card or a letter, you boys around the country (Box 543, Farmington, Mich.); O.B. is not only the daddy of the A.S.T.E. but a scholar and gentleman to boot. A bit o' cheer during convalescence will go a long way.

▼ ▼ ▼

Of late, have met the wives of various members, all of whom assure me that they read this column with considerable pleasure. "What I like about you," said one, "is your evident respect for women." Well, thanks!—but what is novel about that? The truth is that I take women on their individual merits as I do men. They're just different—especially in taking the longest way between two points. The male of the species, on the other hand, takes the short cut. Take, for example, a woman paying her fare on the street car: she'll open her purse—but you've heard that one before—whereas the man just dives into a pocket, flips the change into the box and takes his transfer—then forgets which pocket he put it into. Well anyway, I am grateful for feminine applause (which I'll repay through friend husband when away on a convention) only, the fact that there are feminine readers makes it necessary to pull my punches at times. You know, I hear the funniest stories sometimes, like the one about the man in the night club. It seems—but no! As Trader Horn would say, I'll tell it to your husband. And now, hoping that you all had a Merry Christmas, I wish you one and all a peaceful and prosperous New Year.

Yours as ever,
Handy Andy

The ONLY AIR CYLINDER with SELF-REGULATING AIR CUSHION



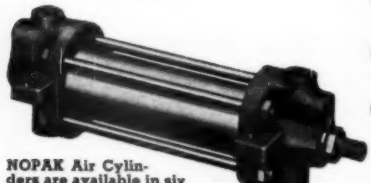
New NOPAK CUSHION-HEAD

1 Self-Regulating Air-Cushion eliminates shock and vibration.

2 Quick-opening Air Duct assures quick starting under full power.

- Eliminates noisy, damaging metal-to-metal impact.
- Prolongs Cylinder Life.
- Cuts Maintenance Costs of entire Cylinder Assembly.
- Sells in same price range as non-cushioned type.
- Assures continuous smooth, quiet, efficient operation, at low cost — without the necessity of readjustment.

Write for Illustrated Bulletin



NOPAK Air Cylinders are available in six standard mountings. Three Types: (a) Non-Cushioned (b) with Self-Regulating Cushion (c) with Adjustable Cushion.

GALLAND HENNING MFG. COMPANY
2757 South 31st Street • Milwaukee, Wisconsin

NOPAK VALVES and CYLINDERS

A 2748-1P

NEW YORK MEETING

(Continued from page 9)

ing which will encourage the teaching of this Science in Vocational Schools, High Schools and Colleges of the Country. These coupled with the other subjects and reports listed above will make the 1940 Meeting an exceptionally valuable one. Speakers from various educational institutions, from different types of industries will also add to the value and interest to Tool Engineers from all sections of the country.

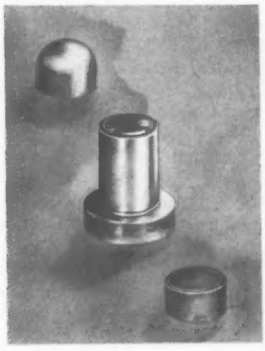
All in all, the attraction of the "big city," the many diversions, the genuine educational features of the meeting, as well as the trip itself prompt us to urge you to attend. Plan now to take a short vacation March 7, 8, and 9 and be with us—we'll be there, we wouldn't miss it for anything.

South American countries, in which 85 to 90 per cent of the cars in use are of American origin, absorbed 57,500 cars and trucks last year, representing 20 per cent of automobile exports, and bringing the total number of American type motor vehicles in use below the equator to more than 585,000.

For a Quick Increase in Plant Capacity —

— look to your tools

Read how modern shops have cashed in on the extra capacity hidden in their tools:—



Multiplies Production by 25 times—Makes Tough Job Practical!

Here's a job that's as tough as they come. The bearing race is formed from 1015 steel, ⅛" thick. After the cup at the left is drawn, the round end is flattened and countersunk by impact and compression. The best steel previously tried failed at 8000 pieces—a mere half-day run. Then the tool maker tried the tool steel recommended in Carpenter's Matched Set. Punch life jumped 25 times to 200,000 pieces. States the shop foreman, "No other tool steel is practical for as tough a job as this."

Customer says, "Improve the Finish"—Salesman asks for "More Speed"—Both Now Happy!

When you are faced with conflicting demands like this, Carpenter's Matched Set Method is an ace-in-the-hole. For instance, in this case, the tool maker was able to put his finger on a tool steel that satisfied both requests immediately. The keen-cutting, tough-edged steel he chose is giving him a production of 300 pieces per hour and 16 hours between grinds—and just look at the finish he is getting.

Tools that were "good enough" a year ago mask plant capacity today!

With demand crowding production and customers demanding faster and faster service—now is the time to cash in on every last unit of hidden plant capacity.

First place to look is in the tool room. In 7 out of 10 plants, production of machines and presses has been found to fall far short of rated capacities. Nothing wrong with the machines, but dies and tools failed to equal the productive ability of modern, high-speed equipment. In a thousand plants, Carpenter's Matched Set Method is helping to meet new demands by pointing the way to tool improvement. With this Manual as your guide, you can quickly put your finger on ways to get more from your own tools. Frequently, that is the quickest, most economical way to provide needed "plant expansion."

THE CARPENTER STEEL CO.

Reading, Pa.

← YOURS

for the asking

HERE IS THE SECRET →

behind finds like these

Carpenter MATCHED TOOL STEELS

THE CARPENTER STEEL COMPANY
151 Bern Street, Reading, Pa.

No obligation. 60 pages of helpful information and data for tool steel users. Experience shows that even in the most modern plants, the average tool is only ½ as good as it might be. With this Manual to help you, you can quickly check up on your own tools—improve them, if necessary. Mail this coupon today for your free copy. Address The Carpenter Steel Company, 151 Bern St., Reading, Pa.

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

New Literature

of Interest to the Tool Engineer

Make your request for literature or information on New Equipment direct to manufacturers named, mentioning "The Tool Engineer."

We are informed by the American Society of Mechanical Engineers that a new book, which amplifies and brings up to date the work of Frederick W. Taylor, is off the press and available to the interested. The A.S.M.E. Committee on Metal Cutting Data has made a very extensive research by investigators all over the world and have conducted experimental work to verify and expand on existing data; the book, then, is entirely up to date. Published, recently, it sells for $5.00.

▼ ▼ ▼

Brown & Sharpe Mfg. Co., Providence, R. I., has added to its line of Attachments for Automatic Screw Machines. Circulars are available to the trade which fully cover the Attachments. These include Longitudinal Turning Attachment for B & S Nos. 00 and 00G Automatic Screw, Turret Forming, Cutting-Off and Screw Threading Machines (High speed), also, Motor Drives for Cross Drilling Attachments for use on B & S Nos. 00G, 0G and 2G High Speed Automatic Screw Machines. In addition, the Company has Motor Drives for Turret Drilling Attachments for the 00G, 0G and 2G B & S machines, all adding materially to the range and convenience of these high production machines. Our readers will do well to acquaint themselves with these Attachments. Write Brown & Sharpe's for copies mentioning THE TOOL ENGINEER.

▼ ▼ ▼

Cerro De Pasco Copper Corporation, 44 Wall St., New York, N.Y., has issued a new bulletin—the Cerromatrix Manual. The booklet, which contains twelve more pages of matter than the previous issue, is of particular interest to die makers, model and instrument makers. The material, adaptable to many uses, is applicable in a wide field, and the manual broaches this field in a very thorough and illuminating manner. We recommend it for consideration by all Tool Engineers, suggest that our readers obtain a copy by writing the Corporation. It's really a good thing; don't miss it.

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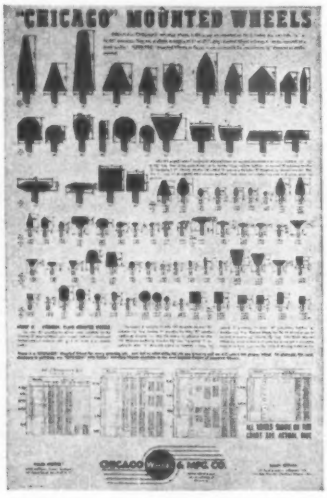
Chicago Wheel & Manufacturing Company, Dept. T/E, 1101 W. Monroe St., Chicago, Illinois will provide to Tool Engineer readers one of their new



wall charts, as shown above, free of charge on request. The chart gives Mounted Wheel sizes, shapes and styles—answers questions on the subject for every tool room and die room.

▼ ▼ ▼

The Barber-Colman Type V, vertical hobbing machine, is startlingly unique in design, may be a "style leader" in future machine design. Hence, the Bulletin which describes this machine is of especial interest to Tool Engineers, and we suggest that users of hobbing equipment as well as our readers in general acquaint themselves with its possibilities. The Bulletin can be had by writing Barber-Colman Company, Rockford, Ill.

▼ ▼ ▼

Tomkins-Johnson Co., 624 N. Mechanic Street, Jackson, Mich., makers

(Continued on page 44)

½ HOUR'S WORK IN 1 MINUTE With the DoALL

At the Ward Leonard Electric plant in Mount Vernon, N.Y., brass plate stock 1/16" thick is stacked in lots of 5 to 20 pieces, depending upon the job, and sawed on the DoAll. These 5 pieces 36" long were sawed in 5 minutes, or 1 minute each. Former time, 30 minutes each.

STARTLING RESULTS

Contour Sawing, the new DoAll process of machining, is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.

Does work of 3 machines. DoAll is a moderately priced, rugged, precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries, by such firms as General Electric, International Harvester, Simmons Co., Picatinny Arsenal, Midwest Machine & Tool, Solar Aircraft, Canadian National Rys., Neptune Meter Co., Fisher Body, etc.

Let a factory trained man bring a DoAll to your plant and show you what it does, what it saves on your own work.

DO-ALL Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

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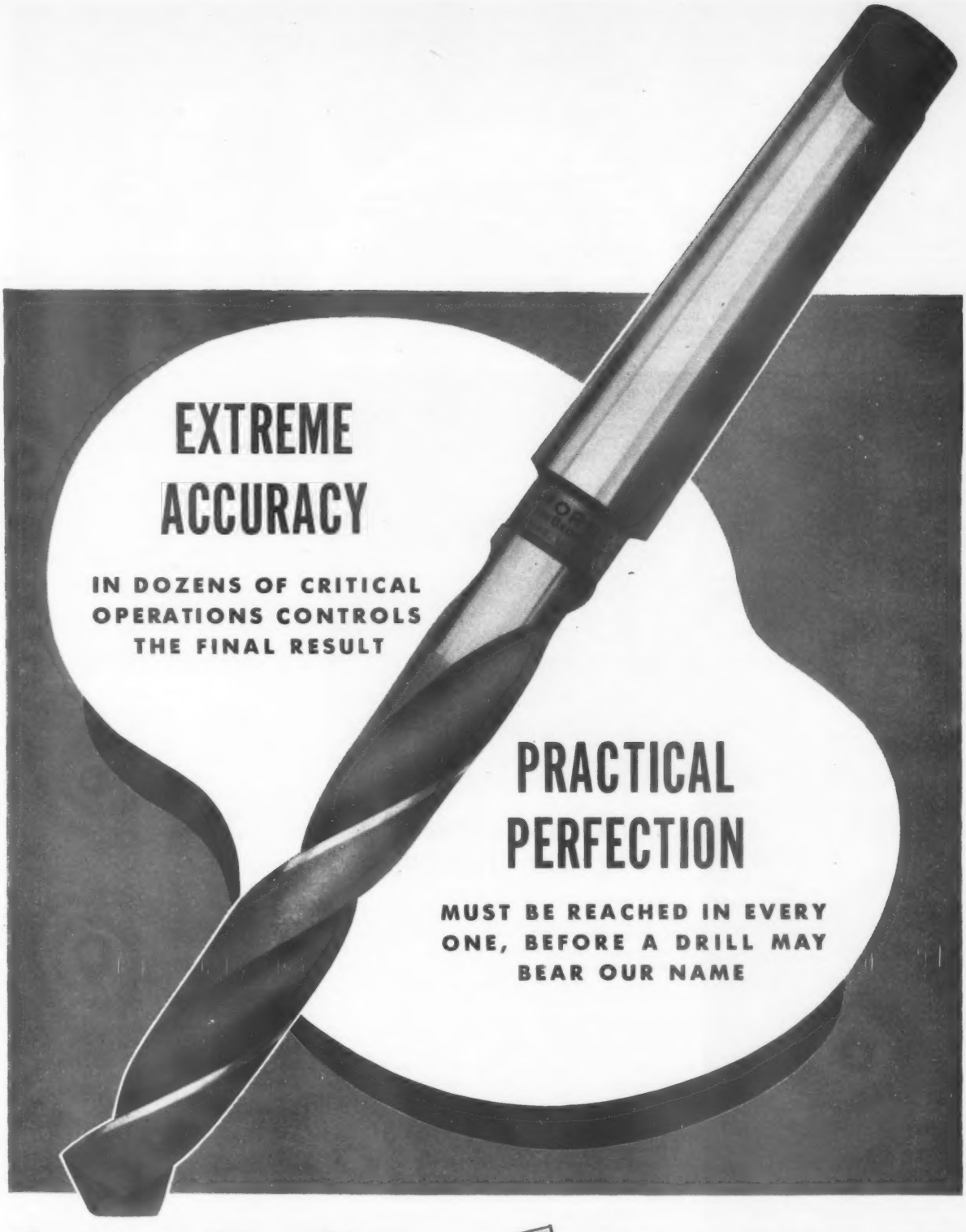
☐ Send data on the DoAll.
☐ Send Free Hand Book.

FREE—New Handbook on Contour Machining—158 pages of valuable metal working helps.

CONTINENTAL MACHINES, INC.
1304 S. Washington Ave.,
Minneapolis, Minn.

Name .....

Address .....



MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

NEW LITERATURE

(Continued from page 42)

of hydraulic and pneumatic equipment among other products, announces Bulletin No. RC-4. It illustrates and describes the T—J Pneumatic Remote Control System, and is very complete with data and valuable information. It should be in your files: send for it.

▼ ▼ ▼

The Doall Digest has just been issued by Continental Machines, Inc., 1304 Washington Ave., South, Minneapolis, Minn. It is an interesting publication of general interest to those engaged in manufacturing, deals especially with Doall machines made by C.M. An illustration is also shown in this issue of the Machine and Progress Chart which will be sent free on request. The Digest is available on request, mentioning THE TOOL ENGINEER, and on company letterhead.

Of particular interest to Tool Engineers is a new Contour Sawing Handbook, just off the press. This is a treatise on the new metal cutting process known as contour sawing, is not a catalog but a text on the subject. There are 300 Illustrations in 160 pages, is replete with data and charts and gives detailed information relating to operation and application of contour sawing. The handbook is a source of valuable engineering data, containing facts essential to the machinery industry. Priced at $1.00, a free copy is available to individuals writing for it on company letterhead. From review, we suggest that the claim of interest and value, is modest. It stirs ideas in cost cutting. Write Continental Mchs., Inc.

▼ ▼ ▼

Of considerable interest to the trade is a Bulletin by Star Machine and Engineering Corporation, Bloomfield Ave. at Grove, Bloomfield, N.J. This Bulletin covers the Star Precision Drill Grinder, a compact tool which, we understand, has many unusual features. Taking drills from No. 41 to ⅝", it is ideally disposed for tool crib service, is claimed to be so simple that a school boy can operate it and turn out a precision job. The Bulletin tells the story.

▼ ▼ ▼

Jones & Lamson Machine Co., Springfield, Vt., has available four new Bulletins, each unusually complete with descriptive matter, tooling suggestions and general specifications, the latter including fully dimensioned diagrams. The Bulletins cover J & L Ram Type Universal Turret Lathes Nos. 3, 4 and 5, Saddle Types 7A, 7B and 7D, Saddle Types 8A, 8B and 8D, and the 8" Fay Automatic Lathe. These Bulletins should be in the files of every Tool Engineer concerned with production by Turret or Automatic Lathes.

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Ex-Cell-O Corporation, 1204 Oakman Blvd., Detroit, has four new Bulletins which are of considerable interest to Tool Engineers and production managers. They feature, in order, the Ex-Cell-O Internal Lapping Machines and Precision Thread Grinders, Style Nos. 33 and 33L, No. 39 and 50, each of the latter of different range and designed for various types of threads. We are very sure that our readers will be interested in securing copies of these bulletins.

▼ ▼ ▼

A pamphlet, issued by Crucible Steel Company of America, 405 Lexington Ave., New York, announces the Company's new Rexalloy Tool Bits. We suggest that Tool Engineers get acquainted with the product, which shows high production possibilities with very moderate cost.

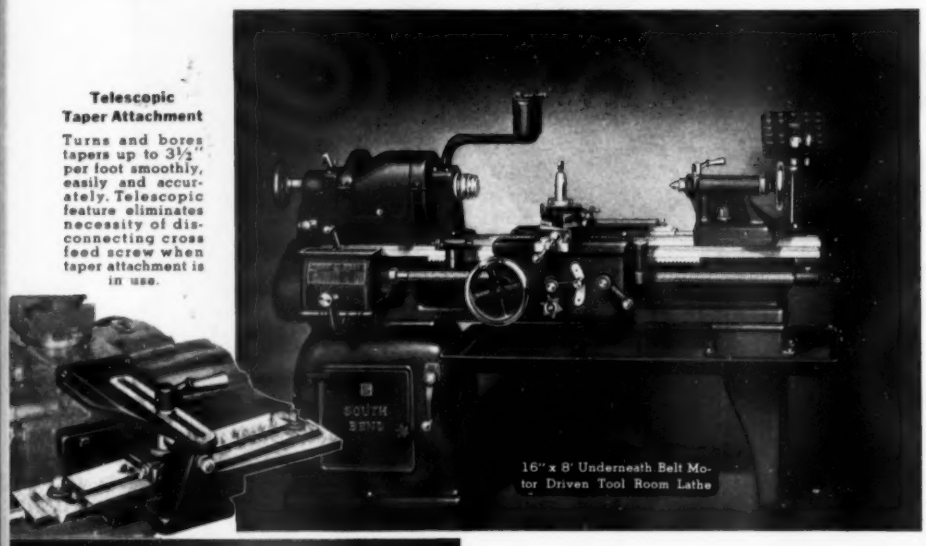
▼ ▼ ▼

American Technical Society, Drexel Ave., at 58th., Chicago, has published 5th edition of "Machine Shop Work," price $2.75. The book is written in "how-to-do-it" style, and while we have not had time, as yet, to digest the contents, a preliminary review promises interesting and instructive reading. The book is by Fred'k. W. Turner and Oscar E. Perrigo, Aldrich Bertrand, reviser.

Am. Tech. S'y. has also produced 2nd. edition of "Production Management, (Simons and Dutton) which retails at $3.50. Both books are timely in view of industrial upturn, each is bound in waterproof cloth.

Telescopic Taper Attachment

Turns and bores tapers up to 3½" per foot smoothly, easily and accurately. Telescopic feature eliminates necessity of disconnecting cross feed screw when taper attachment is in use.



16" x 8' Underneath Belt Motor Driven Tool Room Lathe

13" x 5' Underneath Belt Motor Driven Lathe

9-inch swing 1" Collet Capacity Underneath Belt Motor Driven Tool Room Precision Bench Lathe

SOUTH BEND LATHES FOR REAL EFFICIENCY

In all classes of industry South Bend Lathes are meeting the need for real efficiency in precision machine work. All types of operations, from heavy roughing cuts on production work to precision finishing in tool and gauge departments can be economically performed on South Bend Lathes, because they have ample power, extreme accuracy and an unusually wide range of smooth, vibrationless spindle speeds.

SIZES AND TYPES

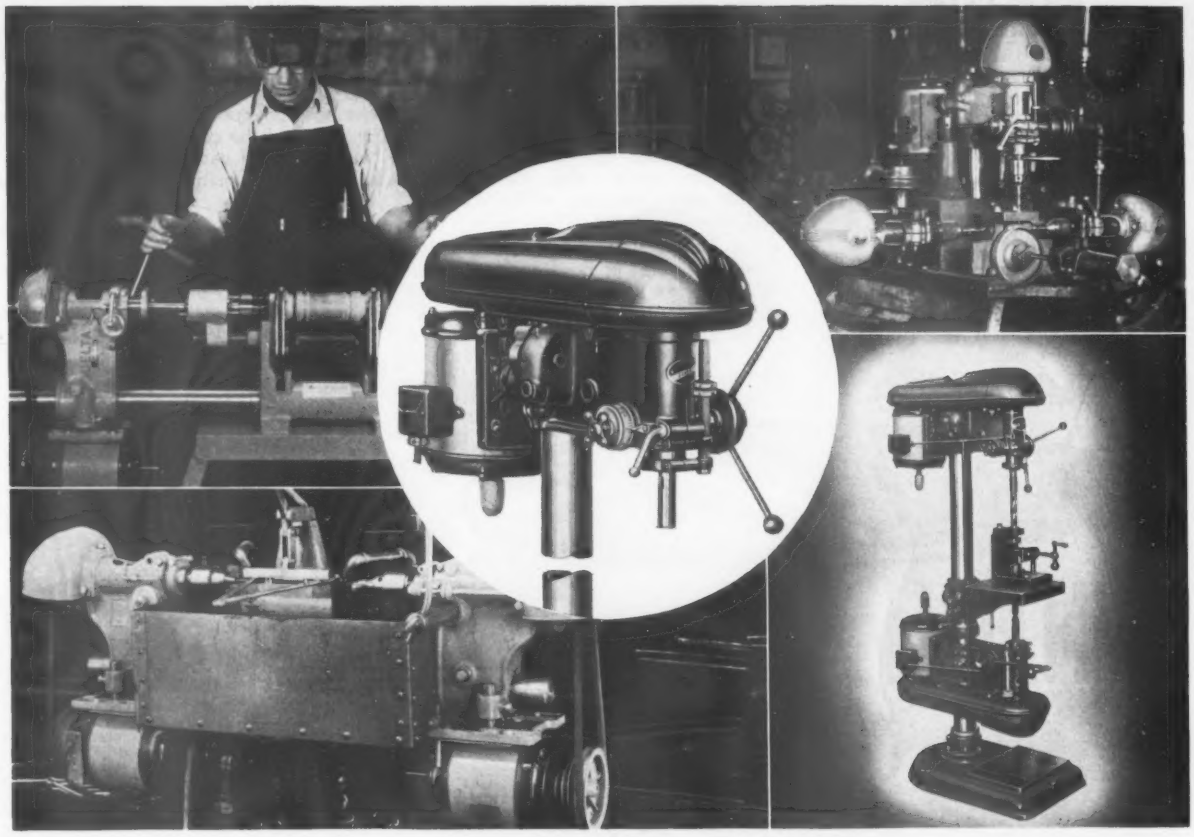
Manufactured in 9", 11", 13", 14½", and 16" swing. Bed lengths 3' to 12', Quick Change and Standard Change Gear types. Motor Drive and Countershaft Drive. Attachments are available for production, tool room, laboratory and general machine work.

New South Bend Lathe Catalog

Write today for a copy of our new 112-page catalog describing all sizes and types of South Bend Lathes.

SOUTH BEND LATHE WORKS
928 E. Madison Street
SOUTH BEND, INDIANA, U. S. A.

Lathe Builders Since 1906



Drill Press Heads for SPECIAL DRILLING SET-UPS

Delta Two-Spindle 17" Drill Press

Drilling capacity: ¾" in cast iron. Table 29½" x 41½" surface 23½" x 36"; 48½" high. Center to center between spindles 18". Column diameter 3½". Maximum distance chuck to table, 26". Quill has 5" stroke. Built-in depth stop gauge. Depth gauge on spring housing. Sealed for life ball bearings. Interchangeable spindles and heads. Shipping wgt. 860 lbs.

Standard Delta drill press heads can be obtained for building special purpose machines at a considerable saving in cost. Alert tool engineers all over the country use these drill press heads in special drilling machines of their own design. These heads cost only a fraction of what it would cost to produce them in your own shop. Complete drill presses, too, can be adapted to special operations by a few inexpensive changes in the user's own shop. For full details, prices on heads and the complete Delta line of low-cost Industrial Power Tools—send coupon for latest Delta Catalog.

DELTA
MANUFACTURING CO.
Industrial Division
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695 E. Vienna Ave., Milwaukee, Wis.

Gentlemen: Please send me your latest catalog which contains specifications and prices of your complete line of Drill Presses.

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City ..... State.....

$200,000 AWARDS

(Continued from page 30)

duct of a welding service; (d) Development, planning and performance of maintenance or repair work with arc welding.

Dedicated to general industrial progress, through scientific interest in and study of arc welding, this $200,000 Award to stimulate widespread study should be productive of far-reaching benefits.

Engineers of a prominent motor car manufacturer estimate the car's cost ($800) would be $3000 without scientific study and application of welding. Statistics from the gasoline-producing industry report that every gallon of gas would cost us 5 cents more were it not for improvement in cracking equipment made possible by scientists who investigated arc welded construction and applied it so as to obtain its maximum benefit. Therefore were it not for the process of welding the higher cost of cars and their operation, would undoubtedly restrict their use tremendously with a resulting increase in general unemployment.

In a previous Foundation Award Program, examples of benefits, which will doubtless be far surpassed by those brought out in the Progress Program because of its very much broader scope, included: cost reduction on bus bodies from $63,045,750 to $31,057,000; saving of $50,000 on a standard model passenger airplane; a saving of 46% in cost of a locomotive frame; first cost saving of $36,000,000 on Great Lakes bulk freight vessel construction; and saving of approximately $637,000 on only 5% of the country's producing oil wells. A total saving of $1,600,000,000 was shown possible in these previous studies.

Participants in the Progress Program have two and one-half years—from January 1, 1940 to June 1, 1942—to pursue their studies and prepare a report summarizing them. All those planning to qualify should record, for future reference, data in the form of designs, charts, photos, notes and other pertinent information on operations as of December 31, 1939.

All inquiries concerning the $200,000 Industrial Progress Award Program should be addressed: Secretary, The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

HIGH in
• cutting quality
• stability
• anti-rust value
Stuart's
"KLEEN-KUT"
TRADE MARK REGISTERED
SOLUBLE CUTTING OIL
Phone or write today for Free Working Sample of this low priced modern soluble oil.
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Warehouses in Principal Industrial Centers

24 page illustrated booklet entitled "Soluble Cutting Oil at its Best" available to personnel of metal working plants. To obtain free copy please write to 2727 South Troy Street, Chicago, using company letterhead and stating your position.

RAPID PROOF

(Continued from page 34)

final digit for the Quotient of 4 obtaining 4 and add to this the final digit of 3 from the Remainder getting 7. This 7 equals the final digit of 7 from the Dividend and the solution checks as correct.

Rapid Proof for the Extraction of Square Root

We will use the number 1320201 and extract the Square Root which will be 1149.

To check, obtain the final digits of the number 1320201 which is 9 and the final digit of the root 1149 which is 6. Now square the digit 6 which will be 36 and the final digit of this is 9. This 9 equals the 9 as final digit of the number and the solution is correct.

Next, take number such as 1322464 and upon extracting the square root we obtain 1149 with a remainder of 2263.

To check, we obtain the final digit of 1322464 which is 4, the final digit of 1149 which is 6 and the final digit of the remainder which is 4. Now, square 6 which is 36 and the final digit of this is 9. Now add the final digit of the remainder which is 4 to the final digit of the root which is 9 getting 13 and the final digit of 13 is 4. This equals the final digit of 4 from the number 1322464 and the solution is correct.

Rapid Proof for the Extraction of Cube Root.

Take the number 1322464 and extract the cube root obtaining as the result 109 with a remainder of 27435.

To check, obtain the final digits of the number 1322464, the root 109 and the remainder 27435 which will be 4, 1 and 3. Now cube the final digit 1 of the root obtaining 1 as the result. To this 1 add the final digit of 3 from the remainder getting 4 and as this equals the final digit of 4 from the number 1322464, the solution is correct.

BORING BARS

STRENGTH and RUGGED CONSTRUCTION make Scully-Jones Boring Bars a necessity where critical inspection demands maximum-accuracy.

The Tool Bit is quickly and accurately set by means of a Micrometer Adjusting Screw. The adjustment is easily made for all sizes within the range of the Bar.

★

WRITE FOR LITERATURE

SCULLY-JONES & CO.

1903 SO. ROCKWELL ST.

CHICAGO • ILLINOIS

Ralph Flanders Defends Usefulness of Tool Engineers

RECOGNIZING that there is a feeling abroad in this country that we are going ahead too fast technologically, Ralph E. Flanders, president of the Jones & Lamson Machine Co., Springfield, Vt., justified the social usefulness of the Tool Engineer in the industrial scheme on five counts. He was addressing the New York-New Jersey Chapter of the American Society of Tool Engineers, at Newark, N.J., recently. His first point was that we have never provided this country with too great a flood of desirable articles to meet the needs of our people. The potential demand is two to three times our present output, he said. Secondly, we cannot have high wages without improved machines, fixtures, tools and gages, nor can we have shorter hours without concomitant improvement in technique as a result of the work of the Tool Engineer. The possibility that the present level of hours and wages is out of balance with machine development may account for the recent stagnation in employment. To the latter two points, Mr. Flanders added that we could not have low prices for quality goods without the work of the Tool Engineer. Finally, there could be no relief from the physical drudgery of work without his aid.

Earlier in his talk, Mr. Flanders, who is a past president of the American Society of Mechanical Engineers and also of the National Machine Tool Builders Association, traced the development of tool engineering from the earliest conception of interchangeable manufacture of gun parts late in the 18th century. At that time the impelling motive was military necessity—the need for quick repair of guns on the battlefield. In the recent past, European nations, particularly France, for similar reasons have been obliged to adopt more intricate tooling in manufacture rather than depend upon the skill of an operator in handling a general purpose machine equipped with only very simple tooling.

In essence, the application of jigs and fixtures to machine tools, the speaker pointed out, spreads the skill of the engineer over hundreds of unskilled workers. Only within the last year have the French turned to the application of skill in the manufacture of jigs and fixtures rather than in the handicraft of workmen. Because they did not do so before was what brought stagnation to industry under the social legislation involving shorter hours and higher pay, introduced during the ministry of former Premier Blum. Points two and three heretofore mentioned had been overlooked. Military necessity dictated the change to more efficient methods. Here in this country, on the other hand, the necessity has rather been the giving of more goods for the public's money, thereby raising the real standard of living.

In the discussion that followed, P. W. Brown, general superintendent of Wright Aeronautical Corp., indicated that in Germany also, general purpose machine tools, with very simple tooling, were being used for aircraft engine manufacture when he visited the country a year ago. Such a policy provided a lot of jobs and trained large numbers of workers, but Mr. Brown envisaged a drastic slowing up in production when these trained workers, who could not readily be replaced, are called into the fighting services. In this country, the skill was being built into the machines and tooling.

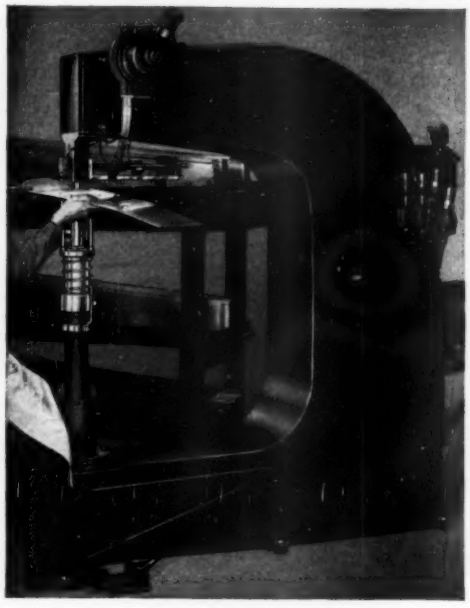
comes now . . .

SPEED of control in HYDRAULIC OPERATIONS

SPEED OF REACTION without sacrificing efficiency is now being had by pneumatically controlling hydraulic power valves. There is an important saving in reaction time of pneumatic controls over the comparatively slower hydraulic reaction in identical circuits.

T-J PNEUMATIC REMOTE CONTROLS provide full advantage of this saving also in that their variety of unit types permits their application to your requirements to be of standardized equipment.

BULLETIN NUMBER RC-4 reports on the high points of these systems in this application type as well as in many others in which they are being successfully and increasingly used. Your copy will be sent promptly upon receipt of your request.



T-J CONTROLS are shown here on a T-J Hydraulic Rivitor. Developed for riveting aircraft fuselage and wing sections, the operator's station is necessarily some distance from the power valve. T-J Pneumatic Controls provide the desired snappy reaction to the power valve.

this is a **TOMKINS-JOHNSON** *product*

Factory at 624 N. Mechanic St., Jackson, Michigan. Agents in principal cities. T-J Products also include Air and Hydraulic Cylinders . . . Rotating Chucks and Cylinders . . . Rivitors . . . Clinchors . . . Special Equipment . . . Brownie Coolant Pumps . . . T-J Die Sinking Milling Cutters.

WHY UNEMPLOYMENT?

(Continued from page 20)

this buying power with serious effect on employment.

Conclusion

The conclusion is that, logically, improvement in employment must come, first, by a price that gives a better useful value; second, by consistent application of income from productive activities to buying power without large diversions to inactive savings; and third, by an increased standard of living, especially for the lower income group. Statistics show that a very modest general increase would easily duplicate the rate of prosperity of 1929. But the third reason is dependent on the first two pav-

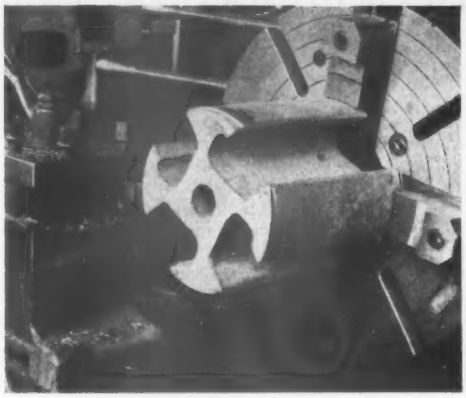
(Continued on page 58)

Because

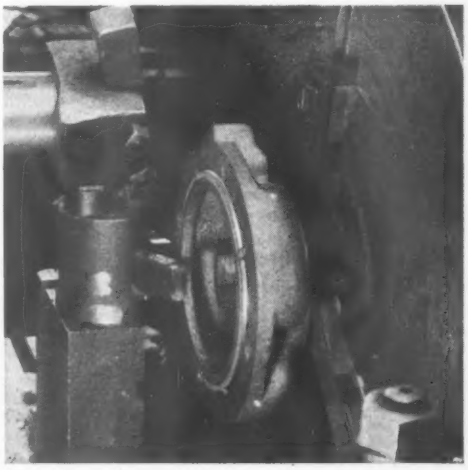
they reduce the cost per piece machined

HAYNES STELLITE "2400" TOOLS *are* STANDARD

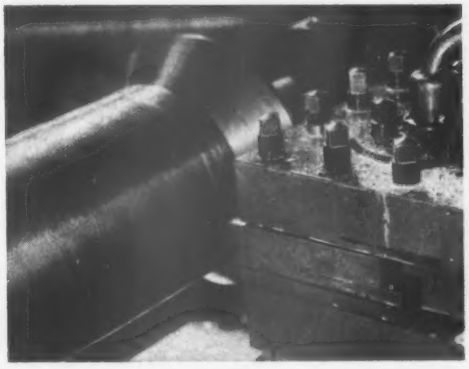
on these Turning Jobs...



INTERMITTENT CUT—Rough-turning a 10-inch diameter pump rotor of hard, tough semi-steel with a Haynes Stellite "2400" solid tool bit. Note the intermittent cut.



75 PIECES PER GRIND—Rough- and finish-turning and facing an 8-inch diameter cast iron floating bearing for a compressor with Haynes Stellite "2400" welded tip tools.



NICKEL STEEL—Rough- and finish-turning the outside diameter of a 7½-inch diameter nickel steel liner with a Haynes Stellite "2400" welded tip tool.

WIDELY EXPERIENCED—Haynes Stellite engineers are widely experienced in production work. They will gladly help you select the most economical cutting tool for each operation. Address Kokomo, Indiana, or the nearest district office—Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, San Francisco, Tulsa—without obligation.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

New York, N. Y. Kokomo, Indiana

High-production metal-cutting tools

2400 HAYNES STELLITE

Red-hard, wear-resisting alloy of cobalt, chromium and tungsten

The words "Haynes Stellite" and the designation "2400" are registered trade-marks of Haynes Stellite Company.

Reclaiming the Railroad Rail

By JOSEPH S. GRAY
MEMBER ROCHESTER, NEW YORK CHAPTER A. S. T. E.

In our ever ending search for methods whereby we can make tools just a little bit less expensive and still maintain the high quality necessary to produce our product, we sometimes go beyond what the old timer would call the straight and narrow path.

Tons of railroad rails have been thrown in the scrap heap because we did not know of any good use to put them to; but, now we realize that we have been throwing away a fair tensile strength, good impact, 89 to 91 B Rockwell steel which we can buy for from $.01 to .02 per pound, and with less machining time than we ordinarily use on forged bars, plane or brake forming dies.

A.S.T.M. specifications for Carbon steel 120 lb. rails:

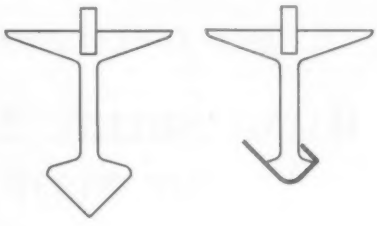
Carbon Percent	0.67 to 0.80
Manganese Percent	0.70 to 1.00
Phosphorus Max. Percent	0.04
Silicon Min. Percent	0.10 to 0.23

Drop Test Requirements

The drop test specimens shall be placed head upwards on the supports and subjected to one blow from the tup, falling free from the following heights:

Weight of Rail Per Yard	Height of Drop in Feet
50 to 60 lb.	16
81 to 90 lb.	18
101 to 120 lb.	20
121 to 140 lb.	22

The drop testing machine shall be the standard of the American Railway



Engineering Association, and the tup shall weigh 2000 pounds, and shall have a striking face with a radius of 5 inches.

This steel can be easily machined with a common planer bit, if a few drops of Carbontetrachloride are dropped on the face of the tool as a lubricant.

For bending heavy sheets or plates with the 110 lb. standard rail (110 lbs. to the yard) with a $2\frac{13}{32}$" head and $\frac{13}{32}$" web, we have ample strength. For bending sheets up to 12 gauge furniture or au'o body steel, the 60 lb. rail is best suited.

Figure 1 shows a common V punch with a 1½ x ½" tongue inserted in the base of the rail for holding the punch in the punch holder of the power brake. This tongue is held in place by knurled socket head cap screws. Both punch and die are treated in this manner as it may be necessary to use the punch and die reversed.

Figure 2 shows how it was only necessary to plane the head of the rail to get a forming punch for a reverse bend, whereas, if a solid bar had been used, the steel would cost at least eight times as much and the machining time would be at least five times as long.

Much could be said regarding the many different forms which can be planed from rails, but this will give those Tool Engineers who are not already familiar with this procedure a lead to the possible savings which can be realized.

Turning Back the Pages

January, 1935 Issue—5 Years Ago—"Ford all set for daily production of 5,000 cars during entire month of January . . . . A.S.T.E. Secretary reports marked shortage of technically trained production men . . . . David Kronke, Packard—Walter Kroy and Henry Rourke, Ford Motor, made new members . . . . Job shops in the Detroit area report a good December."

January, 1939 Issue—1 Year Ago—"A.S.T.E. Officials report Unparalleled Space Reservations for Machine & Tool Progress Exhibition." . . . . R. C. Danly, President of Danly Machine Specialties dies . . . the current upswing in business gives every indication that the improvement will continue through the year. . . ."

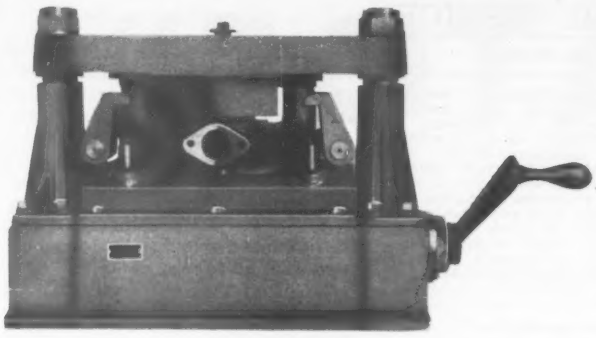
Ever since the introduction of Cemented Carbide, we have continued to refine our processes of applying it to cutting tools and now we can safely say that Gairing Cemented Carbide Tools are as fine as can be obtained.

Because the selection of the proper grade of Cemented Carbide for a particular job cannot be reduced to a simple formula, prospective customers submit complete details to our Engineering Department. We can supply all sizes and types of blades and tool bits.

Before making a decision, submit your specifications and blueprints.

The Gairing Tool Co., Detroit, Michigan
In Canada, Hi-Speed Tools Ltd., Galt, Ont.

SPECIALISTS IN FINE CUTTING TOOLS FOR 21 YEARS



PROPOSAL L-878

Heavy duty built up type fixture drilling automobile motor manifold. All locating, chucking and clamping is done by the movement of operating lever.

DESIGNERS
BUILDERS

ALL TYPES OF
SHOP PRODUCTION
TOOLS

STANDARD FIXTURES
AND FIXTURE LOCKS

SWARTZ TOOL PRODUCTS CO., INC.

5259 Western Avenue — Detroit, Michigan

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Tulsa, Okla.—Brammer Machine & Tool Service Co., Inc.

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Chicago—Ernie Johnson
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.

Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

MAC-ITS Save on Production, Maintenance and Design!

Stronger, more accurate screws can end many tie-ups—save labor and replacements—and cut costs all along the line when your designs take advantage of their greater strength.

Mac-its give you all these savings in 16 standard items. For complete details, call your Mac-it distributor or write today for your copy of Catalog 38, listing the only complete line of heat-treated, alloy steel screws!

THE STRONG, CARLISLE & HAMMOND COMPANY
1392 West Third St., Cleveland · Ohio

You Will Be Surprised

At What We Can Do—

And At What You Can Save

We are represented in your city. Better see our man when he calls.

NATIONAL TOOL SALVAGE CO.

3816 Beaubien, Detroit

Industrial Relations Committee A.S.T.E.

PERSONAL SERVICE

SITUATIONS WANTED

Several thoroughly experienced tool designers and die designers available. Also checkers, draftsmen and apprentice tool designers. We also have the applications of plant superintendents, production managers, machine shop superintendents, chief tool designers, assistant tool superintendents, process engineers, methods and equipment engineers, production and tool room foremen, and sales engineers, all experienced and capable of filling the position they are seeking. For further information call Tyler 5-0145 or write to American Society of Tool Engineers, 2567 West Grand Boulevard Detroit, Michigan.

SITUATIONS AVAILABLE

Wanted Metal Cutting Tool Engineer for designing and servicing tools, preferably on broaching. Call Tyler 5-0145, or write to A.S.T.E.

Layout Designer with experience on hand screw machines wanted. Also good tool and die makers, with experience on progressive dies and the drawing dies for deep shell work. Also Die Sinkers for hot forge brass work. All for vacancies with well known manufacturer in Connecticut.

Wanted Tool Designers—Board men for jig and fixture designs, capable of making sketches and laying out cams.

Sheet Writers required having a full knowledge of operation analysis sheet writing, and familiar with current methods and machines.

Wanted a good Tool Design Supervisor between 35 and 40 years of age. One that has had some directional experience, and has tact, personality, initiative and plenty of get-up-and-go, that is seeking something of a supervisory nature for employment in New Jersey. For further information call Ty 5-0145 or write to American Society of Tool Engineers, 2567 West Grand Boulevard, Detroit, Michigan.

NO GUESSWORK

(Continued from page 17)

is called into use for a variety of services. It has proven invaluable in the production of new parts or redesigning of old ones. This has had to do with the perfection of techniques of production. In particular, it has aided in the perfection of foundry techniques, the X-ray readily revealing imperfections resulting from faulty techniques. Analysis of the radiograph offers an unerring guide for correction.

Salesmen frequently call at the factory with samples of new materials or with fabricated parts which they say are superior to some material or part in use. Radiographic analysis will just about as often quickly determine how accurate the salesman's claim is. The radiographic analysis covers more than strength characteristics, indicating such properties as permeability of wire insulation by oil, or like crucial matters.

CLASSIFIED ADVERTISEMENTS

WANTED: Sales Engineer for Machine Tools in Milwaukee territory. Must be resident Milwaukee, preferably have experience supervising machine shop or tool room. Unlimited opportunity. Give complete details of experience and present employment in reply. Strictly confidential. Box 704, care The Tool Engineer.

Sales Representative

Opportunity to secure the services of an experienced salesman with vast acquaintance in the automotive and industrial field in the Detroit area. A hard-hitting go-getter with excellent personality, mechanical background and ability to produce. Address Box 705, care The Tool Engineer.

RACINE

VARIABLE VOLUME HYDRAULIC PUMPS

Tool Engineers and designers, you are offered a complete service for oil hydraulic systems. Variable volume pumps—Feed controls—Pressure regulators—manual and mechanical type valves. Let Racine assist you with your hydraulic problems.

Extremely quiet, smooth performance. A thoroughly proven efficient pump for pressures up to 1000 lbs. per square inch. Capacities 2000-4000-6000 cubic inches per minute. The Variable Volume feature saves horse-power. Delivers amount of oil actually required. Volume is controlled automatically or manually.

Write for catalog P-10

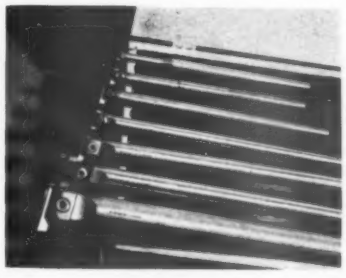
RACINE HYDRAULIC VALVES

A complete line—manual—pilot or electrically operated. Balanced pistons—accurately fitted. For oil-hydraulic installations.

Write for catalog V-10

RACINE TOOL AND MACHINE CO.
1777 STATE ST. RACINE, WIS.

Number 3 Set



Everede Boring Bars are the only bars on the market having the economical triangular bit. These bars permit using a larger bar diameter than usual due to the bit cutting ahead of the bar. This design insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and are each furnished with six high speed steel triangular bits.

Everede Boring Bars permit the use of a solid Stellite or carbide tool bit, accomplished by clamping the bit on the "V" Type grip, which holds it firmly without danger of breakage.

Send for descriptive folder.

EVEREDE TOOL CO.

Willis Stutson
184 N. Wacker Drive, Chicago
Representatives in principal cities

"ROTABIN"

Saves Time of

MEN AND MACHINES

Rotating sections bring stock or tools to you mechanically. No time wasted looking for correct size. Helps solve high cost of handling material in plant. Let us survey and submit a carefully planned proposal of "ROTABIN" best suited to your requirements.——NO COST——NO OBLIGATION.

THE FRICK-GALLAGHER MFG. CO., WELLSTON, OHIO

O K Metal Cutting Equipment is Self-liquidating !

INSTEAD of being an added expense, the O K System is an investment that begins to write itself off the moment it is installed. Compared with solid tools, the O K Inserted-Blade principle makes an immediate reduction in high speed steel cost. Much time (which is money!) is saved by being able to have spare sets of blades and bits always ready. Also, better work is done by having access to the wide variety of blades and bits shown in the O K catalog, the consistent use of which increases the versatility and ability of your operators.

Adapted to Complete or Gradual Change-Over

The O K line includes milling cutters, end mills, face mills, boring heads, reamers, counter bores, multiple operation set-ups, and single-point tools for lathes, shapers, planers, etc. Everything is here for your complete re-equipment — or, a machine or department at a time may be revised. On this, our engineering department will be glad to co-operate. Catalog on request.

THE O K TOOL COMPANY, SHELTON, CONN., U.S.A.

INSERTED-BLADE METAL CUTTING

TRADE O K MARK TOOL SYSTEM

January Chapter Meetings

BALTIMORE

January 8, 1940—Dinner 7:00 P.M. Technical session 8:00 P.M. Sears Auditorium, North and Harford Avenue.

Speaker: A. F. Clark, Representative of the E. I. Du Pont de Nemours & Company.
Subject: "Neoprene" Its development and application in industry.
For dinner reservations call Mr. Stanley S. Johns, 806 Evesham Avenue Baltimore, Maryland, Maryland Phone Tuxedo 2127.

BUFFALO-NIAGARA FRONTIER

January 11, 1940—Dinner 6:30 P.M., Technical Session 7:30 P.M., University Club, 546 Delaware Avenue, Buffalo. Members $1.10, Non-members $1.50.

Speaker: F. W. Warner, General Electric Company.
Subject: "Modern Plastics." Sound movies will be shown.

CENTRAL PENNSYLVANIA (YORK)

January 9, 1940—Dinner 6:30 P.M., Technical Session 8:00 P.M. West York Inn, 1400 W. Market St.

Speaker: R. E. W. Harrison, Vice-President, Chambersburg Engineering Company
Subject: "Drop Forging Practice in Hammers."
Reservations: To Al. H. Richter, York Corrugating Company.

DAYTON

January 8, 1940—6:30 P.M., Gibbons Hotel.

Exhibits: Eight educational exhibits on floor. Open from 5:00 P.M. to 11:00 P.M.
Speaker: Under auspices of Cincinnati Milling Machine Company, and will be announced in monthly bulletin.

DETROIT

January 11, 1940—6:30 P.M. Hotel Webster Hall.

Speaker: W. D. Grindley of Watson Stillman Co.
Subject: "Under the Ground and Under the Sea with Hydraulics."
Exhibit: A model of hydraulic shield used in digging tunnels.
Reservations: Please call Tyler 50145 on or before Wednesday, January 10, 1940.

DETROIT STUDENT CHAPTER

January 25, 1940—6:30 P.M. Dinner $1.25 per plate. United States Rubber Company, 6600 E. Jefferson Ave.

Speaker: M. A. Clark, Manager of Industrial & Public Relations.
Subject: "From the Tree to the Tire."
Reservations: Madison 8422, 10:00 A.M. to 9:00 P.M.

ELMIRA

January 12, 1940—Dinner, 6:30 P.M. Hotel Langwell, Elmira, N.Y.

Speaker: Mr. F. W. Warner, Plastics Division of General Electric, Pittsfield Plant.
Subject: "Modern Plastics," illustrated by motion pictures.

GOLDEN GATE-OAKLAND & SAN FRANCISCO

January 9, 1940—6:30 P.M. Hotel California, Oakland.

Speaker: Prof. M. S. Hugo, Stanford University.
Subject: "Gauges, Tolerances and Gauge Methods."

MILWAUKEE

January 11, 1940—Dinner, 6:30 P.M. Republican Hotel, Colonial Room.

Speaker: W. I. Senger, of the Gisholt Machine Company.
Subject: "Recent Developments in Balancing Machines."
January 26, 1940—Annual stag, Schroeder Hotel, Crystal Ballroom. Tickets now available from the Treasurer.

PHILADELPHIA

January 19, 1940—Dinner, 6:30 P.M. Engineers Club. Meeting, 8:00 P.M.

Speaker: Francis Trecker.
Subject: "Modern Die-Milling Methods."
Reservations: Make with John Noble, care Wm. Sellers Company.

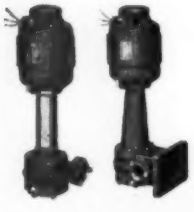
PITTSBURGH

January 12, 1940—Dinner, 6:30 P.M. McCann's Dining Room, Ferry and Diamond Street, Pittsburgh, Pa. Meeting, 8:00 P.M.

Speaker: G. H. Sanderson, Fellows Gear Shaper Company.
Subject: "New Developments in Involute Gears." Illustrated by slides. Your Secretary will appreciate seeing your prospective member at this meeting. Return card to advise me.

(Continued on page 56)

RUTHMAN GUSHER COOLANT PUMPS



Specified as standard equipment by the majority of the Leaders in the Machine Tool Industry. You can have the same dependable service by installing them on your machine tools.

Send details of your coolant requirements for free engineering data and coolant pump recommendation.

The Ruthman Machinery Co.
540 E. Front St., Cincinnati, O.

For SEAL Efficiency

BEARING-IZE

Seal or flat faces, separate or in combination with single or multi-diameters, can be greatly improved at reduced cost with the
ULTRA SURFACE
produced by
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Avail yourself of our comprehensive fund of engineering data as applied to **your product.**

"HOLE"
ENGINEERING SERVICE
307 Boulevard Bldg.
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SHELDON Back Geared Screw Cutting PRECISION LATHES

Made in three sizes (10", 11" or 12" swing) the SHELDON Lathe is just the lathe for your experimental department, repair department or tool room. It is also ideally suited for the manufacturing departments . . . fitted with special tools it is a money maker on second operation work. It can be furnished in many styles and combinations.
No. 1136 WFCQ—11" Swing, 36" between centers, 56" hand scraped semi-steel bed with 2 V-ways and 2 flat ways. Large, hardened steel spindles, and ground all over. Hand Collet capacity ¾". Phosphor Bronze Bearings. Full Quick Change Gear Box. Worm Feed Apron with Power Cross Feed. Thread Chasing Dial. With floor legs, Headstock Motor Drive Attachment (less motor) $355 F.O.B. Factory.

SHELDON LATHES, though low in price, are quality machine tools in every detail . . . in design, materials, workmanship and in features.

SHELDON MACHINE CO., Inc.
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MARVEL

THE SAW that keeps from being idle

Here is MARVEL #8, the metal cutting band saw that puts real meaning into "versatility," "economy" and "capacity."

MARVEL #8 is a "plus" machine in every sense. It does **more** different kinds of cutting than will any other saw. It does **all** work economically.

No "jerky" actions to interfere with accurate cutting and to increase wear, but smooth, continuous rotary motion for easy, consistent production.

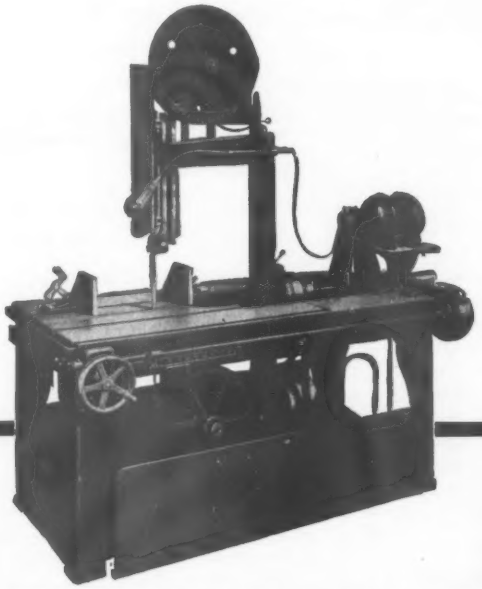
Ball bearings totally enclosed in upper and lower band wheels, blade guide rollers and carriage mean long-life, rigidity and accuracy of cut.

Saw blade is always perpendicular so that notching, coping and slotting can be done conveniently. Automatic blade tension device to assure proper blade tension and prevent breakage.

The only metal band saw that will satisfactorily cut angles, and mitres. Cuts straight and cuts 45° without moving work on bed.

Index cutting, segmenting in equal parts and splitting clamps, rings, connecting rods, bushings, collets, etc., are parts of MARVEL #8 versatility through perfect control, quick chucking facilities, accuracy and speed.

Write for bulletins #600 and #800 about the complete line of MARVEL Sawing Machines which meet all requirements of modern shop production.



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5750 Bloomingdale Ave., Chicago, Ill.

Eastern Sales Office: 199 Lafayette St., New York

Multiple Spline is

BASIC

ENGINEERING DESIGN

TAUGHT AS STANDARD WAY BACK IN SCHOOL DAYS.

IN WIDE USE WHEREVER POWER MUST BE UNFLINCHINGLY TRANSMITTED.

AN old acquaintance from way back in your school days, multiple spline design now serves you on Bristo Socket Screws. Good reason!

Here is power unflinchingly transmitted from the wrench to the screw. No loose, wobbly contact here. No wasted motion. No slipping. Extra strength can be exerted on the turn with no danger of splitting, shearing or rounding the socket. Bristos set tighter, stay tighter. Assemblies take less time. Production costs are cut. Isn't that what *you* want?

Put Bristos on your assembly and prove these advantages for yourself. Send today for sample Bristos and illustrated, informative Bulletin 83-5V. No obligation. The Bristol Company, Mill Supplies Division, Waterbury, Conn.

FEATURES AT A GLANCE!

MULTIPLE SPLINE SOCKET—as positive acting as meshed gears—Won't split, shear, strip, round out, slip or jam—Sets tighter with less effort—No loosening under vibration—Takes wrench without fumbling or skidding.

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Multiple Spline

SET AND CAP SCREWS

Approved by the American Standards Association and the American Society of Tool Engineers.

BRISTO MAKES YOUR PRODUCT BETTER

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PRESSES
SHEARS
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Write for Bulletins Showing Latest Developments in Machines for Fabrication of Sheet Metal

NIAGARA MACHINE & TOOL WORKS
FACTORY – BUFFALO, N. Y.
Cleveland · Detroit · New York

JANUARY MEETINGS

(Continued from page 54)

ROCHESTER

January 10, 1940—Dinner, 6:30 P.M. Todd Union. Technical Session, 7:45 P.M., Lower Strong Auditorium, University of Rochester River Campus.

Speaker: F. W. Warner, General Electric Co., Plastics Dept.
Subject: "Modern Plastics." Mr. Warner will bring a 16 mm. sound and color film entitled "Modern Plastics Preferred."
Reservations: By membership return card or phone Stone 2893.

ROCKFORD

January 4, 1940—Faust Hotel. Entire 11th floor. Educational exhibits continuous from 5:00 to 12:00 P.M. Dinner with entertainment, etc., at 6:20 P.M. Dinner speaker to be announced. Business—Election of Chapter Nominating Committee. Technical Session at 9:00.

Speaker: Y. J. Bruce, Metallurgical Engineer Jones & Laughlin Steel Corp.
Subject: "Aspects of the Mechanics of Machining."

SCHENECTADY

January 8, 1940—8:00 P.M. Rice Hall, General Electric Co., Schenectady.

Speaker: Mr. F. W. Warner, G. E. Plastics Dept., Pittsfield.
Subject: "Plastics." Also a sound and color film on "Modern Plastics Preferred." Members are requested to bring friends.

SYRACUSE

January 9, 1940—Dinner, Syracuse Industrial Club.

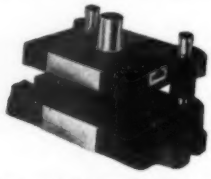
Speaker: J. L. Rodgers of the Bakelite Company.
Subject: "Plastics in Industry," illustrated with slides and sound films.

TWIN CITY—(Minneapolis-St. Paul)

January 10, 1940—Dinner meeting, 6:30 P.M. Dunwoody Institute.

Subject: "Gages and Gaging Systems."
Speaker: A representative of a well-known company. There will be a large exhibit of gages featured at this meeting.

DANLY
PRECISION DIE SETS



Danly All-Steel Sets
Danly Commercial Sets
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9 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

Danly Machine Specialties, Inc.

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DANLY DIE MAKERS' SUPPLIES

T. H. L. FRONT LEVER
BENCH PUNCH

PRICE WITH ONE PUNCH AND ONE DIE—
$37.00
Immediate Shipment

Built for hard, tough work — die cannot lose alignment with punch—all parts interchangeable.

Capacity—½" holes through $\frac{3}{16}$" steel; $\frac{13}{32}$" through ¼" steel. Can also be made for holes up to ⅞" in thinner metal. Stock punches and dies available from $\frac{1}{16}$ to ½" by 64ths.
Weight, 70 lbs.

T. H. LEWTHWAITE MACHINE CO.
(Est. 1890)
307 E. 47th St. New York

Just What You Have Been Wanting—An Economical Live Ball and Roller Bearing Center

For Lathes, Hand Screw Machines, Grinders, and Mills

1. Simplicity and sturdiness adapt this center to heavy duty with extra long life.
2. Sufficient bearings for radial, thrust, and alignment loads resulting in 50% more radial load than the average live center.
3. Large spindle, small head, and short overhang spells rigidity—result, no chatter.
4. Has special oil seal to retain lubricant and resist foreign matter.

A folder giving prices and complete detail will be mailed to you just for the asking.

A lower first and last cost. Let us prove it by sending you one today for a ten day trial, and if not satisfactory in every way return it.

MOTOR TOOL MFG. CO.
12281 Turner Ave., Detroit, Mich.

GAMMONS
OF
Manchester

PRODUCTION TOOLS

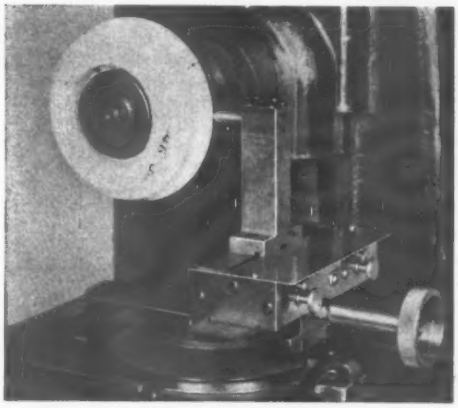
ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOLMAN CO., MANCHESTER, CONNECTICUT

The Vinco Angle Tangent To Radius Dresser for

Internal, External and Surface Grinding Machines

Patented June 5, 1934. Other Patents Pending

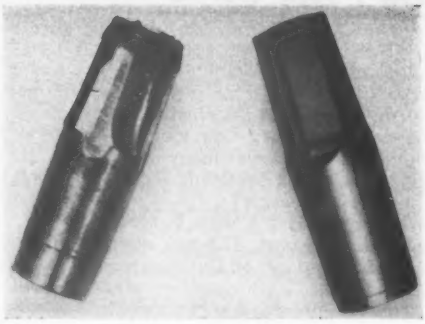


Thousands of dollars are lost annually in tool, gage and grinding departments by using obsolete methods in dressing angles and radii on abrasive wheels. The Vinco Angle Tangent to Radius Dresser has the basic patented feature of dressing angles and radii from the same axis without moving the diamond. Angles and radii are always accurate and tangent. It is acknowledged by hundreds of users to be the only accurate, economical and efficient dresser on the market. It is a permanent, precision-made tool and will last a life-time. It eliminates all worry and uncertainty, and saves 75% in dressing costs. It is fully guaranteed to be satisfactory. *Send for New Descriptive Circular.*

VINCO TOOL COMPANY

7350 Central Ave. **Detroit, Mich.**

DON'T THROW AWAY VALUABLE
CARBIDE TIPPED TOOLS. $ $



- **Write at Once for Our Folder on Carbide Tool Salvage**

Tips Remounted—Shanks Retipped
Round Tools Expanded to Size—
Grinding — Lapping

CARBIDE TOOL SALVAGE DIV.

SUPER TOOL COMPANY

21650 HOOVER RD. **DETROIT, MICH.**

Drive Taps and Reamers

WITH THE

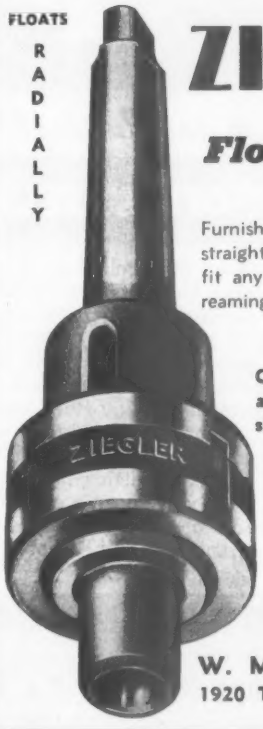
ZIEGLER

ROLLER DRIVE

Floating Holder

"It Always Floats"

FLOATS RADIALLY



Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

Compensates for spindle misalignment, eliminating oversized or bell-mouthed holes.

Holders sent subject to your approval before acceptance.

W. M. ZIEGLER TOOL CO.

1920 Twelfth Street **DETROIT**

LOOKING AROUND

By Perry Scope

IS the tool under consideration necessary?

In the myriad problems which arise from the need for every new tool, the Tool Engineer must answer many questions: but the first he must answer is:

1. Is this tool necessary?
   a.) It is necessary if what it saves justifies its cost. Did you ever study the Law of Diminishing Returns?
   b.) If a slight redesign in product or method will not avoid its need. Why not share your problems? Do you ever talk it over with your Product Designers? Methods Engineers?
   c.) If you cannot use a tool now in your tool room. Do you know what is available there? Do you ever visit your tool crib? —the tool supervisor?—the tool room foreman?

   d.) If you cannot use one of the wide range of tools available on the market. Do you ever study a tool catalog? Do you read the ads in THE TOOL ENGINEER and other good journals? Read the New Patents issued?
   e.) It is only then, necessary that you design and make it when it is more economical in time and cost to build than to buy.

Perhaps a good tool shop will make it for less. When you make your decision have the boss OK it and I wish you luck.

When shall a tool be built?

The second question the Tool Engineer must answer is this. Every well run shop goes according to a schedule, and the more accurate the schedule is planned the smoother will it run.

1. A tool shall be designed and built before the shop needs it.
   a.) Have the date set for the manufacturing schedule of the piece parts under consideration.
   b.) Don't wait for an inspiration—for an idea to strike you—Start working on it. Use some perspiration as well as inspiration.

   c.) Don't use the trite expression "Let them help themselves" they may surprise you and do it, and the boss might discover he doesn't need you.
   d.) Use speed if possible in all rough planning—it quickens the mind—Make 4 or 5 rough sketches of how you could accomplish the end—Make a better sketch of the best.
   e.) Submit them all to the boss—He's no "dumb-bell" either.
   f.) Use a check system for every job you design. You expect a man greasing your car to use a chart.
   g.) Cut out all guess-work. Make your own list of factors in Tool Engineering that you should use in your particular plant—Apply them to every job you design—You will avoid a lot of trouble if you do.

Next month I'll give some suggestions along this line.

PERRY SCOPE.

* Remember a brain is no stronger than its weakest think. All men are created equal to anything—P.S.

For Really Fast Metal-Cutting!

ABRASIVE CUT-OFF WHEELS

Imagine cutting-off 1½" round cold rolled steel stock in 2½ seconds! That's what Abrasive Company Cut-Off Wheels are doing regularly on high speed abrasive cut-off machines. And on production work that means important savings in time and money; to say nothing of improved quality of cut. Resinoid (synthetic resin) bonded for high speed operation up to 16,000 S.F.P.M., they cut practically all materials encountered in modern industry, including all types of steel, alloy steel, cast iron, brass, bronze, aluminum, forgings, wrought iron, stone, marble, granite, brick, tile, terra cotta, hard rubber, plastics, hard carbon, porcelain, etc.

If you operate cut-off machines or have a cutting problem investigate Abrasive Company Cut-Off Wheels. Details gladly sent on request.

SIMONDS
Famous Family of
METAL CUTTING
TOOLS

TRADE ABRASIVE MARK

ABRASIVE COMPANY
Division of Simonds Saw and Steel Co.
Tasony and Project Sts., Philadelphia, Pa.

WHY UNEMPLOYMENT?

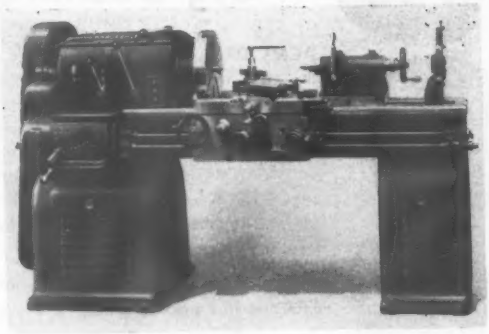
(Continued from page 48)

ing the way. Unemployment is not the result of the machine, and less work will not lower prices.

We may with a clear conscience regard our past accomplishment as a benefit to society; but we should now help bring to light the real causes of the trouble, and by influencing public opinion, attempt to remedy conditions which balk for the time being the enjoyment of a more abundant life.

From 1900 to 1939 total production of motor vehicles in the U. S. and Canada totaled 78,000,000 units.

NEW
BRADFORD LATHE



MADE IN
12" — 14" — 16" SIZES

Bulletin No. 246

The Bradford Machine Tool Co.

CINCINNATI **OHIO**

Established 1840

Dealers Wanted in Some Territories.

BOYAR-SCHULTZ PROFILE GRINDER
Bench Model No. 1

" 'Our Boyar-Schultz Profile Grinder has for seven months, given satisfactory service, beyond my expectation.' Praise indeed, to come from our Tool Room Foreman who is a very exacting and practical man."

This statement from a letter in our files, is from a well known manufacturer and is one of many similar expressions of the operation of BOYAR-SCHULTZ Profile Grinders in tool and die shops.

If you have work requiring grinding and fitting difficult shapes, contours and irregular profiles found in the making of dies, punches, templates and cams, it will pay you to investigate the time saving possibilities of Boyar-Schultz Profile Grinders.

Write for Circulars

Boyar-Schultz Corporation

2116 Walnut Street **Chicago, Illinois**

Columbia
TOOL STEEL

OILDIE
NON-DEFORMING

C .90
Cr 1.60
W .45

Users report trouble-free, improved performance on Heavy Blanking, Punching and Shaving dies.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
GENERAL OFFICE AND WORKS
520 EAST 14TH. STREET • CHICAGO HEIGHTS, ILL.

ARMSTRONG

Step up your Tool Room Schedule with more . . .

ARMSTRONG TOOL HOLDERS

The best solution for a jammed-up tool room is More ARMSTRONG TOOL HOLDERS. With the right tool holders for every operation you can step up machine tool speeds and feeds far beyond the "standards" set in the old bar tool days.

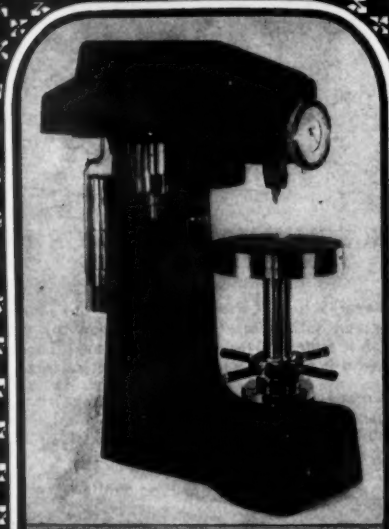
The Armstrong System provides tool holders for every operation on lathes, planers, slotters and shapers—over 100 different sizes and shapes each correct in design and proportion, correct in cutting angle and tool approach; each the most efficient tool available for its particular work painstakingly worked out to give maximum rigidity with maximum clearance. Because ARMSTRONG TOOL HOLDERS are strong beyond need, handy and multi-purpose, there is a tendency in many shops to use a few tool holders for all types of work. This is false economy for the maximum efficiency can only be had with the correct type and correct size ARMSTRONG TOOL HOLDER for each operation—and for each machine tool.

If you want to break the jam in your tool room, to turn out the same work in fewer machine hours, check the tool holders on lathes, planers, slotters and shapers against the new C-39 Catalog. Then, when properly tooled step-up speed and feeds.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
360 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse and Sales:
San Francisco **199 Lafayette St., New York, N. Y.** **London**

Buy ARMSTRONG TOOLS from your Supply House

ROCKWELL
HARDNESS TESTER



All our wits, experience and equipment we devote solely to these testers.

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MECHANICAL INSTRUMENT CO. INC
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Standardized
Jig Bushings

ACME DRILL JIG BUSHINGS are made by the most exacting and scientific methods—insuring long wear plus accurate fit—concentric within .0003" full indicator reading. Prompt delivery from stock on over 6700 ACME Standard items and over 4200 A.S.A. Standard items all completely finished ready for use. **Special sizes to order.**

Send for Bulletin containing complete data and low prices.

● Manufacturing specialists of **hardened** and **ground** complete machine parts requiring **extremely close limits, lapped fits,** etc.; also **hydraulic appliances** for pressures up to **20,000 lbs.** per sq. in.

ACME INDUSTRIAL CO.
208 N. LAFLIN STREET - CHICAGO, ILLINOIS

CERROMATRIX saves 180 hours in this Punch and Stripper—

Mitcham Works Ltd. made this punch and stripper plate complete in 20 hours, using Cerromatrix as shown in stripper plate and in mounting of punches. Estimated time if done by fitting and filing methods — 200 hours. This tool has produced several hundred thousand blanks of .0625" steel sheet with no signs of shifting of punches.

Send for new free Cerromatrix Manual.

CERRO DE PASCO COPPER CORPORATION
44 WALL STREET • • • NEW YORK, N. Y.
BRITISH ASSOCIATES: MINING & CHEMICAL PRODUCTS LTD., LONDON, ENGLAND
CANADIAN REPRESENTATIVES: DOMINION MERCHANTS LTD., MONTREAL, CANADA

NOW AVAILABLE — 3 NEW BODY SIZES
OF PRESS FIT BUSHINGS CONFORMING TO LATEST A.S.A. REQUIREMENTS

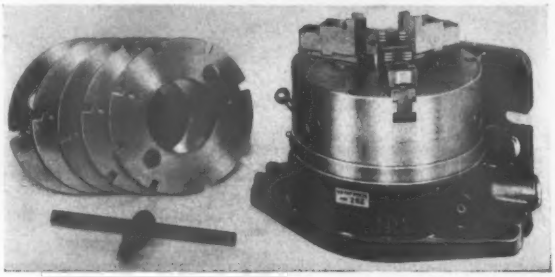
Three new sizes now complete the standard line of Universal quality drill bushings. All Universals have rust proof black domes and superfinished bores assuring concentricity and unexcelled wearing qualities. Write for facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

YOU'LL SAVE TIME
AND TROUBLE . . . BY SPECIFYING NATIONAL TWIST DRILLS, HOBS, REAMERS . . . MILLING CUTTERS, *Special* TOOLS

NATIONAL TWIST DRILL AND TOOL CO.
DETROIT, U. S. A.
Tap and Die Division, WINTER BROS. CO., Wrentham, Mass.
Factory Branches: New York, Chicago, Philadelphia, Cleveland
Distributors in Principal Cities

The Hartford
"SUPER-SPACER"



ACCURATE—RIGID—FOOL-PROOF

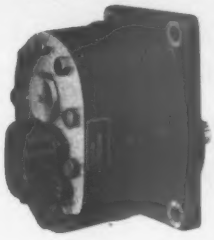
The Hartford Super-Spacer is a new and superior spacing device for the rigid control of accurate machining operations within its scope. It is simple and rugged in design, substantially and precisely constructed and adaptable for a multitude of machining operations. Speeds and feeds limited only by the capacity and power of the machine are available with the Super-Spacer. Heavy cuts do not impair the accuracy of indexing, which is extremely rapid and positive—without the possibility of error. This chuck provides a secure and sufficient means for holding most jobs.

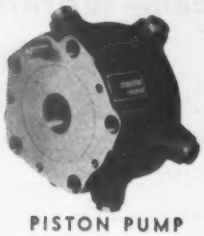
For further information write

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD **CONNECTICUT**

GEAR PUMP





PISTON PUMP

BARNES

HYDRAULICS

GEAR AND PISTON PUMPS
FEED AND TRAVERSE UNITS
CONTROL VALVES

W. F. & JOHN BARNES
SQUARE RAM & SLIDING HEAD
SELF-CONTAINED UNITS

HYDRAULIC CIRCUITS ENGINEERED TO SUIT INDIVIDUAL REQUIREMENTS

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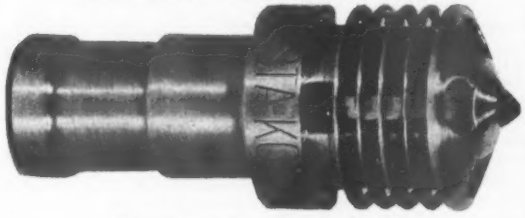
MAIN OFFICE
AND FACTORY
ROCKFORD, ILL.

JK SMIT SONS

Precision Diamond Tools



For Accurate Work

The illustration above shows the effective design of the STA-KOOL Diamond Tool Holder.

STA-KOOL—Dissipates Heat
Prolongs Life
Reduces Cost

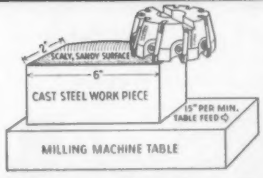
Write for further information about STA-KOOL — "Tool Engineered" for precision.

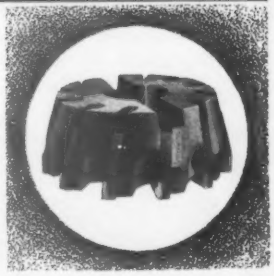
J. K. SMIT & SONS, INC.
157 Chambers Street, New York, N.Y.

968 Farmington Ave., Hartford, Conn. — **Law and Finance Bldg. Pittsburgh, Pa.**

Detroit — Chicago — Seattle — Toronto

The Bright Spot
IN MILLING SCALY STEEL CASTINGS





10 blade cutter shown above; 12 blade cutter at right. Photo courtesy McCrosky Tool Corp., Meadville, Pa.

KENNAMETAL

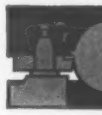
Mills 15 to 30 Times More Pieces in ⅛ the Time per Piece

TYPE OF BLADE	PIECES PER GRIND	MILL. TIME/PIECE
KENNAMETAL-tipped	300	Less than ½ min.
High Speed Steel	10 to 20	3 minutes

The above tests were made on steel *as cast;* that is, *without* previous removal of sand or scale. This is an unusually severe test for a hard carbide material, yet there was no breakage of the KENNAMETAL-tipped blades. KENNAMETAL is harder than the hardest tool steel, but stronger than other carbides of same hardness range . . . assuring outstanding performance over a long period of tool life.

INVESTIGATE KENNAMETAL CHIP BREAKER TOOLS

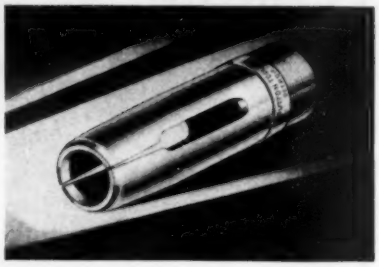
Because of its superior strength, chip breakers may be ground on KENNAMETAL without seriously weakening the tip—enabling you to dispose of long, unbroken steel chips safely . . . quickly . . . economically. Whether used to tip single point cutting tools or special tools such as milling cutters, KENNAMETAL will speed up production — produce more accurate work. Write for catalogue and complete information without delay.

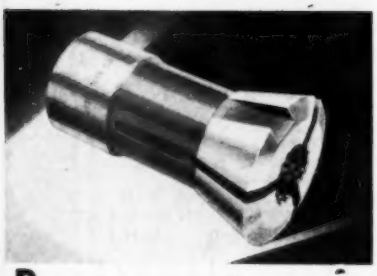


McKENNA METALS Co
600 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

Team-Working for Your Profit

Sutton FEED FINGERS with long-life spring temper





Sutton DIAMOND-GRIP Collets grip tighter under less tension.

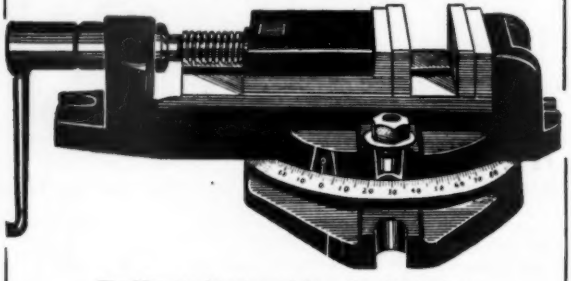
PUT this team to work on your screw machines and watch production improve and spoilage drop. For full details ask for Sutton Catalog No. 12.

SUTTON TOOL CO., 2895 West Grand Blvd., Detroit, Mich.

ACCESSORIES FOR SCREW MACHINES

VICTOR BARGAINS IN NEW SWIVEL VISE

The Reliable Vise—with the powerful grip designed for use on Milling Machines, Shapers, Planers and Drill Presses.



The Vise can be removed from the circular base and used as a plain Vise if desired.

JAWS ARE TOOL STEEL, HARDENED AND GROUND
CIRCULAR BASE GRADUATED IN DEGREES.

SPECIFICATIONS

Width of Jaws 6 inches, Depth of Jaws 1½ inches, Jaws Open 4 inches, Weight 55 pounds.

Price $16.50

Width of Jaws 4 inches, Depth of Jaws 1¼ inches, Jaws Open 3 inches, Weight 30 pounds.

Price $11.50

On purchases of two or more 10 Per Cent Discount. Money refunded if not satisfactory.

VICTOR MACHINERY EXCHANGE
251 Centre Street New York City

Announcing AN ADJUSTABLE DEPTH COLLET CHUCK BY UNIVERSAL

No tang or taper required. Uses broken or whole drills. Adjusts to within .002" to .003". Write for facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

MR. ENGINEER!

You will be interested in our NEW VERTICAL PRESS TYPE WELDERS for precision work. CHAS. EISLER has over 50,000 SPOT WELDERS in daily use. Welders from ¼ to 500 KVA.

We also make a full line of standard and special TRANSFORMERS.

Please write to us for more information.

A. C. Arc Welders from 100 to 400 amps.

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EISLER ENGINEERING COMPANY
744 So. 13th St.
(Near Avon Ave.)
Newark, New Jersey

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You get ADDED VALUE
. . . . . because of
—advanced modern designs
—new and better materials
—improved inspection methods
when you select tools from Catalog 33
B·S Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

DAVIS BORING TOOLS

Perform for

Carrier

Air Conditioning

Set-up time reduced to a minimum by the quick and accurate interchangeability of Davis Expanding Blocks

IN this interesting set-up, Davis Expanding Block Type Boring Tools are used to bore compressor cylinders for the Carrier Corporation, Syracuse, New York.

These dependable Davis Tools, mounted in a six-spindle Moline Cylinder Boring Machine, rough and finish bore the cylinders, after which the latter are finish-reamed to size.

Davis Block Type Boring Tools have proved very efficient on this set-up. Their quick and accurate interchangeability has reduced the set-up time to a minimum and resulted in a very satisfactory and economical performance.

If you have a difficult or unusual boring job, it will pay you to find out just what Davis Boring Tools could do for you. Send us prints of your work and, without obligation, we will submit you a helpful, specific recommendation.

DAVIS BORING TOOL DIVISION
Larkin Packer Company, Inc., St. Louis, U.S.A.

DAVIS BORING TOOLS